Potential and Likely On-Site and Off-Site Environmental Risks from Chemicals found at the Balloon Track, Eureka, California

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Qualifications

I am an Associate Professor and Senior Researcher in Environmental Science and coordinating director of the West Texas A&M University Environmental Science Program. As shown in my attached curriculum vitae, (Exhibit A), I have a doctorate in Fish and Wildlife Science specializing in ecological risk assessment and modeling of contaminant effects on ecological habitats and receptors. I am also a member of the Institute of Hazardous Materials management and a Certified Hazardous Waste Manager at the highest level (Masters Level # 1694). I am also a member of the Society of Environmental Toxicologists and Chemists (SETAC) and the Texas Commission on Environmental Quality (TCEQ) Ecological Risk Working Group. I am the principal investigator for the TCEQ effort to develop ecological "protective cleanup levels" for chemical contaminants in specific habitats found in Texas. I have provided support to the United Nations Environmental Program, World Bank and United Nations Food and Agricultural Organization on environmental cleanup, risk assessment and monitoring in Azerbaijan, Russia and Romania.

I have served as an advisor to the Chlorine Manufactures Association Board addressing "persistent toxic bio-accumulating chlorinated chemicals (PTBs)" and have written a position paper on the risk and cleanup of "persistent organic pesticides (POPs)" for the World Bank. I served as the southwest regional coordinator on the Secretary of Interior's Task Force on Selenium and Other Toxic Substances (with independent National Academy of Science panel oversight) and organized both screening level and detailed risk assessments for Dept. of Interior projects in the Southwest. I have managed large-scale ecological risk assessments at such sites as the Department of Energy Pantex Nuclear Weapons Plant and Oak Ridge National Laboratories. I was the principle author of the Ecological Risk Assessment Program Plan for Evaluation of Waste Sites on the Savannah River. I have over 30 years experience in virtually all aspects of environmental risk assessment, restoration, and protection. I have publications and numerous presentations that deal directly with ecological risk assessment. A listing of my publications and technical papers are included in my attached curriculum vitae. I have taught and continue to teach Ecological Risk Assessment at the university masters level and Agricultural Risk Assessment at the doctoral level.

I am familiar with the procedures, methods and models used in ecological risk assessment as well as those used in laboratory analytical work and EPA accepted quality assurance and validation requirements.

I was retained by Ecological Rights Foundation and Humboldt Baykeeper to provide expert testimony about the ecological risks present at the Balloon Track (located at 736 Broadway, Eureka, CA).

My testimony has been accepted in court proceedings on environmental risk issues however I have not provided testimony that has gone to trial in the past four years. I am being compensated as a consultant at an hourly rate of $150.00 per hour.

Specific Qualifications

I have specific experience in working with metals, chlorinated organic compounds including PCBs, Dioxins/Furans and pesticides. Specific work includes testing and evaluation, development of "protective cleanup levels" and site remediation of those chemicals.

Approach

In performing this preliminary risk assessment I have reviewed selected historical documents on the property as well as documents that provide needed background information on the site, surrounding sites, habitats found on site and expected aquatic and terrestrial species. I have used standard scientific methods and procedures in the analysis of potential for environmental and ecological adverse risks that can be or have the potential to be attributable to contaminants found on and associated with the site. I have reviewed peer-reviewed studies and toxicity testing and I rely in part on the results of those studies. I have utilized specific literature sources as well as the Hazardous Substances Data Bank (HSDB). HSDB is a comprehensive, peer-reviewed toxicology database for about 5,000 chemicals and is maintained by the Agency for Toxic Substances and Disease Registry (ATSDR) under the U.S. Department of Health and Human Services, Public Health Service. The database along with other toxicology databases is accessible at the United States National Library of Medicine Toxicology Data Network (TOXNET). I have reviewed data collected on July 30, 2007 and January 10, 2008 by Soil/Water/Air Protection Enterprise (SWAPE) and samples collected on July 12, 2000 by the State of California Regional Water Quality Control Board, North Coast Region (RWQCB). I have also reviewed the laboratory quality assurance and control package for SWAPE July 30, 2007 samples including chain of custody and methods of analysis and found the results to meet methods and recovery QA/QC requirements and are therefore useable for the following analysis. On the SWAPE 2008 samples, I have referenced preliminary data.

Other documents that were reviewed include the Final Remedial Action Plan UPRR Eureka Railroad Yard and Adjacent Lease Properties dated July 1, 2005, and the RWQCB Preliminary Assessment/Site Inspection on the site dated May 7, 2001. I also considered summaries of data collected by Defendants' consultants prepared by Plaintiffs consultants, which have been provided with their expert reports, as well as personal communications with other consultants retained by plaintiffs and attorneys in this case.

I visited the site on January 10, 2008. I arrived at the site at approximately 7:00 a.m. P.S.T. There had been a heavy rainfall the night before. The temperature was 53 degrees F. with cloudy skies. As the day progressed, the temperatures increased to the mid-60's with clear to partly cloudy skies. I took photographs of the site, which are attached and may be used as exhibits. Specific observations and photographs were taken to document (1) an oil sheen in the western ditch extending approximately 80 meters above the SWAPE S-7

(7/07)(Photo 1). The water in the ditch was draining from north to south ultimately into the culvert near samples SWAPE S-5 (7/07) and SED 2 (1/08). Photo 2 is taken of the contents of the large open top steel tank located in the northern part of the site. Photo 3 shows leaking substance from tank drain cap. Photo 4 shows one of several railroad tie piles on site that offer den habitat for mammals. During the January 10, 2008 site visit, terrestrial and aquatic wildlife were observed on the site. Both freshwater and estuarine wetlands were observed on the site.

Setting

The site, commonly referred to as the Balloon Track, is located at 736 Broadway in Eureka, California. The site occupies approximately 30 acres in a commercial and industrial area. The site is bordered on the north and northwest by Waterfront Drive and Humboldt Bay, on the west by Clark Slough, on the south by industrial and commercial properties along Washington Street and on the east by commercial and industrial properties. The site was originally owned and operated by Northwestern Pacific Railroad Company and was used as a railroad switching, maintenance, and freight yard from the late 1800's until the mid 1980s (RWQCB, 2001). In 1888 most of the site was undeveloped tidal marsh except for one railroad track that traversed north to south along the present northwestern boundary. Beginning in the late 1800s and into the early 1900's the tidal marsh was filled (RWQCB, 2001) and railroad maintenance buildings and facilities were constructed. Operations at the site included:

* Fueling and repair of locomotives and railroad cars,
* Storage of Bunker C oil in above ground storage tanks,
* Use of diesel fuel on site,
* Underground fuel storage tanks,
* Former oil disposal pits,
* Cleaning and dismantling of railroad cars,
* Use of herbicides along railroad tracks,
* Management, storage and disposal of old railroad tracks, equipment, hazardous substances, and various other solid and hazardous wastes
* Various other industrial operations (RWQCB, 2001).

Most of the site facilities have now been removed except for such structures as the turn-table, large above ground open-topped storage tank, a loading dock structure and service roads. Numerous stacks of debris, including used railroad ties and mounds of what appears to be surface soil, are found on the site. The site is now vegetated in low disturbance areas and wetland vegetation is established in low-lying areas and in the drainages found on the site.

History of Investigations

Environmental investigations began in 1988 with the removal of three underground storage tanks with oversight provided by the Humboldt-del Norte County Department of Public Health. In late 1988, the lead regulatory oversight was transferred to the RWQCB (MFG, 2005). Investigations and activities at the site are summarized in the Preliminary Assessment/Site Inspection Site EPA ID Number: CAD983644899 dated May 7, 2001 and the Final Remedial Action Plan, UPRR Eureka Railroad Yard and Adjacent Lease Properties, dated July 1, 2005. In addition, SWAPE collected samples from the site on July 30, 2007. Additional samples were collected by SWAPE on January 10, 2008.

Ecological Risk Assessment

The ecological risk assessment process is conducted in a four-step process (USEPA 1989). The first step, Hazard Assessment, identifies the presence of contaminants that can cause adverse effects. A preliminary dose-response evaluation is conducted to identify the contaminants that pose an ecological risk. Step two, the Exposure Assessment, begins with the development of a conceptual fate and transport model to determine contaminant source, including vertical and lateral extent of contaminated media, physical fate and transport of those contaminants, identification of exposed habitats, biological transport and fate, baseline delineations of affected communities/populations/Threatened/Endangered Species and species of concern. Step three, the ecological effects assessment, is used to evaluate the contaminants effects on the habitats and receptors. Step four, a Weight-of-Evidence-Risk-Characterization, is conducted to quantify the risk of the site. This overall iterative process is repeated as more data becomes available. For example, the process can be used in the preliminary evaluation of a site and continues through final evaluation of the risks to the final action decision process.

Balloon Track – Preliminary Risk Assessment

Step 1. Hazard Assessment

In this step, the contaminants are identified based on review of sampling data on the various media. The results are compared to toxicity data to determine the potential for effect. Screening benchmarks for selected media are often used to screen the contaminants to identify those that have been found in the environmental media at levels that could cause an adverse effect. The National Oceanographic and Atmospheric Administration (NOAA) developed the "Screening Quick Reference Tables (SQuiRT) for use by the Coastal Protection & Restoration Division of NOAA in identifying potential impacts to coastal resources and habitats likely to be affected by hazardous waste sites (NOAA, 1999). The Tables were compiled from various sources commonly used and accepted by regulatory agencies and risk assessors. Specific values are discussed in the following sections.

The results from the RWQCB July 12, 2000 Preliminary Assessment/Site Inspection have been summarized in a table entitled "Analytical Results Summary-Sediment, July 12, 2000, Sampling Event" prepared by Carpenter Environmental Associates (CEA) and is attached as Exhibit B. The table also provides a comparison of the sampling event results to the NOAA SQuiRTs values for "Freshwater Upper Effects Threshold" (UET) and the marine "Apparent Effects Threshold" (AET). Clark Slough is tidally influenced and as such is considered estuarine. Since the estuary can be either freshwater or marine, depending on tide and rainfall, I have compared sediment contaminant concentrations to the freshwater and marine screening values.

The results of the SWAPE sampling event is summarized in a table entitled "Analytical Results Summary-Sediment, July 30, 2007, Sampling

Event" which was prepared by CEA consultants and is attached as Exhibit C. The table provides comparisons of the sediment sampling results to the NOAA SQuiRTs freshwater UETs and marine AETs. The NOAA SQuiRTs are intended for use as screening values only. NOAA AETs for marine sediments represent concentrations in sediments above which adverse impacts would always be expected to the biological indicator due to exposure to that contaminant alone. Conversely, adverse impacts are known to occur at levels below the AET. Only the lowest potential AET is listed. AET values were developed for use in Puget Sound (Washington). UETs and AETs are based on consideration of single contaminant exposure and do not address potential for additive effects of contaminants or potential for biomagnification. UETs for freshwater sediments were derived by NOAA as the lowest AET from a compilation of endpoint analogous to the AET endpoints. The UETs for organic contaminants are generally listed for sediments containing 1% total organic carbon (TOC). Because TOC data was not available organic contaminants were compared directly to the UET.

The laboratory results from the January 10, 2008 SWAPE sampling event are included as Exhibit D. A site map showing sampling locations for the July 30, 2007 sampling event is included as Exhibit E and a site map showing the January 10, 2008 sampling locations is included in Exhibit F. (TEFs were updated by WHO in 2005 (Van der Berg, 2006) and the laboratory utilized these TEFs on the January 10, 2008 sample data however the updated 2005 values did not significantly change the TEQs calculated using the 1998 values).

Based on this screening, the following contaminants were identified as posing the greatest risk at the site (see chart below). While the summary tables (Exhibits B and C) include values for both freshwater UETs and marine AETs, those sites not in direct contact with tidal water were screened using the freshwater UETs. Cadmium was identified at 4.7 mg/kg (UET and AET 3.0 mg/kg) at one site in the SWAPE 2007 results (Exhibit C) and in two sites in the RWQCB July 2007 results at 3.2 and 3.7 mg/kg (Exhibit B). All levels were near the screening values so Cadmium was not advanced as a contaminant posing a significant risk. PCBs and Dioxins and Furans were not analyzed in the RWQCB investigation. PCBs were found in two of the SWAPE 2007 samples (S-1 and S-6) well above the UET freshwater screening values and were advanced as a contaminant posing a significant risk. Total Dioxins and Furans were analyzed as well as 17 congeners. Toxicity Equivalency Factors(TEFs) established by the World Health Organization as reported by Van den Berg (1998) were used to develop Toxicity Equivalents for the Dioxin and Furan congeners to 2,3,7,8-TCDD for the July 30, 2007 data. PCB 1260 was the only form identified so it is addressed separately and without the need for use of TEF equivalency.

Chemicals of Concern Requiring Further Evaluation
Metals Arsenic Chromium (Total) Lead Nickel Zinc PCBs Aroclor 1260 Dioxins/Furans 2,3,7,8-TCDD (TEQ toxic equivalence for dioxins/furans)

Step 2. Exposure Assessment

In this step, the contaminant source area is compared to ecological habitats found with the contaminated or potentially contaminated area to determine the potential for exposure. A complete pathway is when a direct link or exposure to a contaminant or one that ultimately will be transported to a media/habitat resulting in exposure. The project site has both permanent and intermittent wetlands as well as upland soils. The conceptual physical transport of contaminants can be via volatilization into the air, percolation into the subsurface soils contaminating surface soils, subsurface soils, and ultimately shallow and deeper ground water. Contamination of surface water percolating through contaminated soils and/or contamination of surface water via erosion also provide a transport mechanism for those contaminants. Due to the shallow depth of groundwater and tidal influence, the contaminants in soil/sediments, surface water and shallow groundwater pose a direct link to terrestrial and aquatic receptors. Terrestrial soil then serves as a source for groundwater contamination. Contaminated surface water runoff and eroded contaminated sediments can then be transported to wetlands that can then be accumulated with ultimate transport to Clark Slough and Humboldt Bay.

Biotic habitats for the site were characterized by H. T. Harvey & Associates (2008) as disturbed grassland, freshwater emergent wetland, brackish marsh wetland and seasonal wetland. Transitional habitat between freshwater emergent wetland and brackish marsh wetland was also identified. Species composition for each habitat type is detailed in the H. T. Harvey and Associates report (2008). In addition, sediment and surface water sample locations from the July 30, 2007 and January, 10, 2008 sampling events were characterized based on the four habitat types. The 9 sediment sample points (i.e. S-1, S-4, S-5, S-6 and 6-7), and the January 2008 sediment samples (i.e. SED 1, SED 2, SED 3, SED 4) were taken within three of the four different habitat types including (1) freshwater emergent wetland, (2) brackish marsh wetland, and (3) transitional habitat between freshwater emergent wetland and brackish marsh wetland. (HTH, 2008, Fig. 6 (which I will use as an exhibit to support my testimony)).

SWAPE samples S-1 (7/07), S-4 (7/07), S-6 (7/07), S-7 (7/07), and SED 4 (1/08) were recorded in freshwater emergent wetland habitat found in several drainages ditches on the site. These ditches retain water long enough to support emergent wetland plant species (HTH, 2008).

SWAPE sample S-5 (7/07) was recorded in transitional habitat between freshwater emergent vegetation and brackish marsh wetland located in the southernmost portion of a drainage ditch directly adjacent to the northeast side of Clark Slough. Several remnant stands of brackish marsh wetland occur as narrow bands along the opposite banks of Clark Slough in the southwest section of the site, and transitional habitat occurs in the southern most portion of the ditch where SWAPE S-5 (7/07) were collected (HTH, 2008). Dominant brackish species include bulrush, cordgrass, arrow grass and brass buttons. SWAPE samples SED 1 (1/08), SED 2 (1/08) are located in muted tidal aquatic habitat within the brackish marsh bed of Clark slough and SED 3 (1/08) is located outside of the tide gates and represents a sediment sample from Humboldt Bay at the mouth of Clark Slough.

Representative Species in the habitats found on site and in the upland and wetland habitats were discussed with biologists from H.T. Harvey and Associates biologists (personal communications January 10, 2008) and include:

Birds

Semipalmated Plover	(*Chradrius semipalmatus*)
Killdeer	(*C. vociferus*)
California Gull	(*Larus californicus*)
Western Gull	(*L. occidentalis*)
Caspian Tern	(*Hydroprogne caspia*)
Rock Pigeon	(*Columbia livia*)
Common Raven	(*Corvus corax*)
Tree Swallow	(*Tachycineta bicolor*)
Barn Swallow	(*Hirundo rustica*)
Song Sparrow	(*Melospiza melodia*)
White-crowned Sparrow	(*Zonotrichia leucophrys*)
House Finch	(*Carpodacus mexicanus*)
House Sparrow	(*Passer domesticus*)
Brown Pelican	(*Pelecanus occidentalis*)
Double-crested Cormorant	(*Phalacrocorax auratus*)
Black-crowned Night Heron	(*Nycticorax nycticorax*)
Elegant Tern	(*Thalasseus elegans*)
Black Turnstone	(*Arenaria melanocephala*)
Heermann's Gull	(*L. heermannii*)
Common Murre	(*Uria aalge*)
Great Blue Heron	(*Ardea Herodias*)
Red-tailed Hawk	(*Buteo jamaicensis*)
Mallard	(*Anas platyrhychos*)

Fish/inverts

Threespine stickleback	(*Gasterosteus aculeatus*)
Starry flounder	(*Platichthys stellatus*)
Staghorn sculpin	(*Leptocottus armatus*)
Coastrange sculpin	(*Cottus aleuticus*)
Prickly sculpin	(*Cottus asper*)
Saddleback gunnel	(*Pholis ornata*)
Juvenile Dungeness crab	(*Cancer magister*)

Mammals

River otter	(*Lutra canadensis*)
California vole	(*Microtus californicus*)
Raccoon	(*Procyon lotor*)
rats (Introduced)	(*Rattus spp*.)
House mouse	(*Mus musculus*)

Amphibians

Pacific tree frog	(*Hyla regilla*)

Considering the habitats found at the site and the distribution of the contaminants, complete pathways would include avian piscivore, avian carnivore, avian omnivore, Mammalian omnivore, fish, aquatic invertebrates and plants. Representative species are selected to represent other species within feeding guilds within the habitats (USEPA, 1998). In this preliminary assessment, the indicators to be addressed are as follows:

Terrestrial	Aquatic
Soil Invertebrates	Benthic Invertebrates
Vole	Pacific Tree Frog
mouse	Stickleback
Raccoon	Sculpin
Red-Tailed Hawk	Trout*
	Mallard*
	Otter

* Surrogates for Threatened and Endangered species and selected due to available toxicity data.

Portions of the site drains into Clark Slough which is tributaryto Humboldt Bay. Humboldt Bay is the second largest estuarine embayment in California. Estuaries are of vital ecological importance to the bay and provide valuable habitat for a variety of species. The estuaries and the associated wetlands are particularly important to the health of the Bay. In addition to commercial and recreation species, the Bay and surrounding area supports numerous endangered, threatened and species of special interest. Such species as the Coho Salmon (*O. kistuch*), Chinook Salmon (*O. tshawytscha*) and Northern California Steelhead (*O. mykiss irideus*) are listed under the Endangered Species Act as threatened. Brown Pelicans have been observed feeding at the Humboldt

Bay/Clark Slough confluence (personal comment Scott Terrill, H. T. Harvey and Assc. January 10, 2008). On June 28, 2007 EPA approved California's 2006 Section 303(d) List of Water Quality-limited Segments which included Eureka Plain HU, Humboldt Bay for dioxins/furans and PCPs. The dioxins/furans was based on bioaccumulation data in fish and shellfish.

Step 3. Ecological Effects Assessment

The use of indicator species for each habitat allows the evaluation of each contaminant to determine to ecological effects of the contaminant on each receptor. This approach is a vast improvement over historic single species risk assessments. Using the habitat based approach and indicator species that are representative of those habitats reduces the likelihood that a contaminant toxic effect will be missed (USEPA, 1998).

ARSENIC

Arsenic has been used in metallurgy, as a preservative and as a herbicide and pesticide. Toxic effects include reduced reproduction in soil invertebrates and stunted growth and death in plants. Some plants such as brake ferns hyper-accumulate arsenic making them useful for site remediation but toxic to herbivores. In mammals, arsenic is known to be teratogenic crossing the placenta and causing deformations and sometimes death of the fetus (USEPA, 2008). In mallard ducks, growth rate was reduced and egg laying was delayed and high doses can result in death. Arsenic can inhibit aquatic plant growth with marine algae growth inhibited at levels as low as 10-22 ug/L (USEPA, 2008). Background values reported by NOAA (2004) were reported at 1.1 mg/Kg in freshwater sediments and from 5.2 - 97 mg/Kg in soils (NOAA, 2004). Bioconcentration factors (BCFs) which define the expected bioconcentration from a specific media to a receptor group reported by EPA (1999) were as follows: soil to soil Invertebrate .11, soil to plant .036, water to aquatic Invertebrate .73, water to algae 293 and water to fish 114. Based on these results arsenic would be expected to bioconcentrate in algae tissue as well as in fish tissue.

Lethal-dose to the experimental population for a prescribed exposure ("LD 50") values in mice ranged from 13.39-763 mg/Kg (Lewis, 1996. Sample, et. al (1996) calculated NOAELs for the mouse (total exposure 1.261 mg/kg/day), Brown-headed Cowbird(Males) at 2.46 mg/kg/day and Mallard Ducks at 5.135 mg/kg/day.

The maximum value found in the SWAPE samples, S-5 (7/07) (Exhibit C), which is located in the freshwater emergent/brackish marsh wetland at 695 mg/Kg is well above the expected background and exceeds all NOAA screening level criteria for freshwater sediments, and exceeds the marine AET (35 mg/kg) by 19 times. The SWAPE S-5 (7/07) sample exceeded the highest screening value included in the NOAA SQuirTs (2004) which was the effects range median (ERM) at 70,000 ppb or 70 mg/kg for marine sediments. The ERM is the 50th percentile of toxicity effects and as such is the level at which adverse effects would be expected. The freshwater UET and probable effects level (PEL) (17 mg/kg) was exceeded in all five SWAPE samples and in 4 of the 11 RWQCB samples located in fresh or transitional habitats. The sample RWQCB

S-13 (7/00) (connection between Clark Slough and Humboldt Bay was 2.0 mg/kg well below the maximum 695 mg/kg found on site. The ditches provide a transport mechanism for the contaminant into Clark Slough and ultimately into Humboldt Bay. A review of the high concentrations and the potential for bioconcentration in algae and fish indicate that the arsenic poses a significant risk to aquatic primary consumers and fish. Considering an assessment endpoint of protecting fish prey such as the stickleback, sculpin and juvenile salmon, the contaminant requires additional characterization and detailed risk assessment. Due to the high potential for bioconcentration from water to algae and fish receptors, arsenic poses a significant risk to aquatic primary consumers and fish predators. Further characterization of the source areas and vertical and lateral extent of the contamination and concentrations in the intermittent wetlands and Clark Slough is needed.

CHROMIUM (TOTAL)

Chromium is a naturally occurring element that is present in several forms. The most common forms are chromium (0), trivalent chromium (Chromium III) and hexavalent chromium (chromium VI). Chromium III occurs naturally and is an essential nutrient. However, chromium (VI) and (0) are generally produced by industrial processes. Only total chromium was analyzed so form specific toxicity cannot be evaluated. BCFs reported by EPA (1999) are as follows: soil to soil invertebrate .01, soil to plant .0075, water to aquatic invertebrate 3,000, water to algae 4,406, water to fish 19 and sediment to benthos .39. No bioconcentration factor has been measured for Cr(III) in freshwater organisms (HSDB, 2008). Bioconcentration factors for Cr(III) in saltwater organisms range from 86 to 153, which are comparable to the BCFs for Cr(VI) in saltwater species (HSDB, 2008). In fish muscle, the BCF for Cr(VI) was <1; BCFs were 125 and 192 in oyster and blue oyster, respectively (HSDB, 2008). For Cr(III), BCFs of 116, 153, 86 were reported for oyster, soft shell clam, and blue mussel, respectively. Weighted average BCF for Cr(III) and Cr(VI) in the edible portion of fish/seafood was 16. Oysters were found after 84 days to have a BCF of 125 in their soft parts for Cr(VI), while blue mussels showed a BCF of 192(2). BCFs for Cr(VI) range from 125 to 236 for bivalve molluscs and polychaetes. BCFs for total chromium of 440 in mollusks, 100 in crustacean muscle, and 70 in fish muscle, have been reported(4). Snails showed a BCF of 10+6 (HSDB, 2008). BCFs for total chromium of 1600 in benthic algae, 2300 in phytoplankton, 1900 in zooplankton, have been reported (HSDB, 2008). A shrub (Leptospermum scoparum) showed an accumulation factor of 10+3 compared to normal plants (HSDB, 2008). Seaweed showed an accumulation factor of 10+2 (HSDB, 2008). Hexavalent chromium compounds, when present, are more likely to be in solution than in sediments (except for insoluble salts such as lead and zinc). This makes them directly available to aquatic life. In general, invertebrate species are more sensitive to acute exposures to Cr(VI) than fish species. Chromium may bioaccumulate in algae, other aquatic vegetation, and invertebrates, but it does not biomagnify. Chronic exposure to chromium inhibits growth in duckweed and algae, reduces fecundity and survival of benthic invertebrates, and reduces growth of freshwater fingerlings (USEPA, 2008).

There was one report of chromium above the UET and AET at 114 mg/Kg at SWAPE S-1 (7/07) (Exhibit C) in the eastern ditch that exceeded the freshwater UET. Other values were very near the UET and are well above background for soil of 37 mg/Kg and 7-13 mg/Kg in freshwater sediments (NOAA, 2004). The sample RWQCB S-12, which is in Clark Slough, exceeds the marine AET. The screening values are intended to be used for screening purposes only and only address single chemical effects. As such, they do not address additive effects or bioconcentration and effects on upper trophic level consumers. Therefore the 114 mg/kg value in freshwater emergent wetland and the 80.3 mg/kg Clark Slough value, which exceeds the marine AET, and other values which are well above background, in addition to other heavy metals found in the area, could cumulatively pose a significant ecological risk to aquatic receptors. Additional site characterization is needed to determine the source areas and vertical and lateral extent of the contamination.

NICKEL

Nickel is used in metallurgy in alloys, in electoplating and in corrosion protection. Nickel has a low potential to bioconcentrate but does have BCFs of 61 in water to algae, 28 water to aquatic vertebrate and 78 water to fish. The nickel from sediment to water is influenced by pH and hardness (EPA, 1999). Amphibians appear to be highly sensitive to dissolved nickel with an LC 50 of 50 ug/L for the Eastern Narrow-mouthed toad. High levels have also been identified as effecting reproduction in mammals and causing teratogenic effects in offspring. High values ranging from 81.5-101 mg/kg were found on the site in the ditches. All SWAPE samples (which) exceeded the freshwater UET and PELs. SWAPE S-5 (7/07) lies in the transitional freshwater emergent/brackish marsh habitat and exceeds the marine ERM. In the RWQCB samples, the freshwater UET was exceeded in 9 of the ll samples and all samples exceeded the freshwater PEL. The intermittent and permanent freshwater emergent wetlands on the site and the sensitive estuarine wetlands in Clark Slough provide habitat for amphibians such as the Pacific Tree Frog. The amphibians are an important prey source for avian predators such as the Black Crowned Night Heron and Great Blue Heron. Potential effects are direct toxicity to the frogs, reduction of amphibian abundance as prey and as a potential bioaccumulator of nickel and biological transport to predators. Most samples from the RWQCB and SWAPE sampling events exceeded the Freshwater UET (Exhibits B and D). Nickel contaminant concentrations pose a significant ecological risk to amphibians and aquatic and terrestrial predators. Additional site characterization to determine the source areas and vertical and lateral extent of contamination is needed.

LEAD

The main uses of lead are in the manufacture of storage batteries, ammunition, nuclear and x-ray shielding devices, cable covering, ceramic glazes, noise control materials, bearing, brass and bronze, casting metals, solders, pipes, traps, and bends. Tetraethyl lead was used as a gasoline additive that was banned in the mid-1970's due to concern over increasing atmospheric concentrations. Concerns over waterfowl ingestion of lead shot has also lead to the ban of lead shot for waterfowl hunting. Background concentrations range from 4-17 mg/Kg in freshwater sediments to 700 mg/kg in soils with a geometric mean of 17 mg/Kg. Toxic effects include mortality and impaired egg hatching success in birds, in mammals reduced reproductive success, reduced offspring weights and kidney damage in the young at 1000 ppm exposures over three generations (Sample et al (1996)). Sample et al (1996) calculated daily intake NOAEL concentrations at 8 mg/kg/d. EPA (1999) reported bioconcentration factors for lead at .03 for soil to soil invertebrate, .045 for soil/sediment to plant, 5,059 for water to aquatic invertebrate, 1,706 for water to algae, .09 for water to fish and .63 for sediments to benthic invertebrates. The bioconcentration factors for mussels and oysters were 2,570 and 1,400 while hard clams had a relatively low factor of 17.5 (HSDB, 2008 from Kayser, R., D. Sterling, D. Viviani (eds.). Intermedia Priority Pollutant Guidance Document). The potential for bioconcentration of lead from water is dependent on acidity or pH as well as hardness. One lead value in RWQCB sampling (Exhibit B) was 645 mg/kg well over 3 times the freshwater UET and 50% over the AET. Three of five SWAPE samples exceeded the freshwater UET and 5 of the 11 RWQCB samples exceeded the criteria (Exhibit B and C). Seven of the 11 RWQCB samples exceeded the freshwater PEL. Due to the bioconcentration from sediments to plants and from water to algae and from water to clams, lead posses a significant ecological risk to terrestrial predators and to aquatic primary consumers and predators. Additional sampling and characterization is needed to determine background lead concentrations and the source areas of the higher concentrations in the area of RWQCB S-6 (7/00) and SWAPE S-6 (7/07), which is located in a freshwater emergent wetland.

ZINC

Zinc is used in electroplating, metal alloys and cooling towers as anodic inhibitors. The zinc content of non-contaminated soils is in the range of 10 to 300 mg/kg with a mean concentration of about 50 mg/kg. In natural waters, zinc can be found in several chemical forms, such as, hydrated ions, metal-inorganic complexes or metal-organic complexes. Hydrated zinc cations may be hydrolyzed to form Zn(OH)2 or ZnO. In anaerobic environments ZnS may be formed. Based on monitoring data, zinc is expected to adsorb to suspended solids and sediment in water. Due to the ionic nature of zinc salts, volatilization from water surfaces is not expected to be an important fate process. Monitoring data suggests that it is found in virtually all aquatic organisms. BCF values for freshwater fish and marine fish were reported as 1,000 and 2,000, respectively.

BCF values of zinc were reported as: 4,000 (freshwater plants), 40,000 (freshwater invertebrates), 30,000 (chronomid larvae), 1,000 (freshwater fish), 1,000 (marine algae), 100,000 (marine invertebrates), 24,000 (oysters), 2,000 (marine fish), 700 (yellow fish tuna),500(skipjack tuna) (HSDB, 2008). After exposing rainbow trout to zinc for a period of 30 days in river water, it was concluded that zinc accumulates in the gills, liver, kidney and opercular bone, but not the muscle (HSDB, 2008). High concentrations of zinc have been found to increase fetal absorption and to reduce fetal growth rates in rats and reduced egg hatchability in white leghorn hens (Sample et. al. 1996). Sample et al (1996) calculated NOAEL exposure concentrations at 160 mg/kg/d for mammals and 14.49 mg/kg/d for birds.

NOAA (2004) background values in freshwater sediment ranged from 7-38 mg/kg. Zinc concentrations in the ditches, especially the east ditch with maximum from 393 mg/kg (SWAPE S-1 (7/07)) to 1030 mg/kg (SWAPE S-4 (7/07)) along with RWQCB values ranging from 514 to 764 mg/kg indicating a source area near SWAPE S-4 (7/07). See Exhibits B and C. Zinc at SWAPE S-4 (7/07) exceeded the freshwater UET by 2 times and the freshwater PEL by 3 times. RWQCB sample results exceed the freshwater UETs in 2 of the 9 samples taken in the ditches. One of two RWQCB samples taken in Clark Slough exceeded the both the freshwater UET and the marine AET. Considering the potential for bioaccumulation in freshwater invertebrates zinc concentrations identified at the site also pose a dietary risk to those terrestrial animals consuming aquatic plants and aquatic invertebrates. Zinc poses a significant ecological risk to primary consumers and predators. The site requires additional characterization to identify the source areas and to delineate the vertical and lateral extent of the source and contaminated area.

PCBs - AROCLOR 1260

Polychlorobiphenyls ("PCBs"), such as Aroclor 1260, are mixtures of different congeners of chlorobiphenyl and the relative importance of the environmental fate mechanisms generally depends on the degree of chlorination. In general, the persistence of PCB congeners increases with an increase in the degree of chlorination. It has also been shown that the higher chlorinated congeners in PCBs are susceptible to reductive dechlorination by anaerobic microbes found in aquatic sediments. Aroclor® is strongly sorbed to soil and remains immobile when leached with water; however, the mixture is highly mobile in the presence of organic solvents (USAF 1989). Water-borne PCBs not sorbed to sediment or suspended solids can readily volatilize due to low water solubility. PCBs are resistant to chemical degradation by oxidation or hydrolysis. However, biodegradation, especially of lower chlorinated PCBs, can occur (USAF 1989).

PCBs have high bioconcentration factors, and due to lipophilicity, especially of highly chlorinated congeners, tend to accumulate in the fat of fish, birds, mammals, and humans (ATSDR 1995). In humans, relatively greater amounts of PCBs have also been identified in skin, liver, and breast milk (ATSDR 1995). Bioconcentration factors reported by EPA (1999) were 1.13 for soil to soil invertebrates, .01 for soil to plants, 5,538 for water to aquatic invertebrates, 476,829 for water to algae, 230,394 for water to fish, .53 for sediment to benthic invertebrates. PCBs are known carcinogens and developmental toxicants. They are suspected endocrine toxicants/disruptors, gastrointestinal and liver toxins as well as neurotoxins (HSDB, 2008). PCBs are also suspected of impacting reproductive behavior in birds (Fry, 1994). The expected effects of PCBs are considered additive to those of the dioxins and furans (HSDB, 2008).

The PCB concentrations exceeded the freshwater UET in 2 of the five samples taken by SWAPE in July 2007. The concentration at SWAPE S-1 (7/07), which lies in a freshwater emergent wetland, was over four times the freshwater UET. PCBs were not analyzed in the RWQCB samples. Considering the screening value exceedences, additive effects with other compounds found at the site, and the potential for bioconcentration and biomagnification in the aquatic food chain, PCBs pose a significant risk to upper trophic level predators. Further site characterization identification of the source areas and delineation of the vertical and lateral extent of the source is needed.

Dioxins/Furans as 2,3,7,8-TCDD 2,3,7,8-tetrachlorodibenzo-p-dioxin) Toxic Equivalents

Polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzo furans (PCDFs) constitute a group of persistent environmental chemicals. Polychlorinated dibenzo-p-dioxins occur as 75 different isomers. There are 22 possible tetrachlorodibenzo-p-dioxin isomers, but only one isomer that contains chlorines at the 2,3,7, and 8 positions. 2,3,7,8-TCDD does not occur in the natural environment and is formed from the incineration of wastes and production of bleached wood pulp and paper. It also occurs as a contaminant in various pesticides and herbicides (HSDB, 2008). Dioxins and furans are also common impurities in pentachlorophenol (PCP) wood treating products (Geomatrix, 2007). The California State Water Resources Control Board analyzed commercial PCP products and found dioxin and furan congeners in PCP product, with concentrations of 170,000 ppm, to have the penta, hexa, hepta and octa congeners of polychlorinated dibenzo-p-dioxins at levels from 11 to 216,000 ppm and the tetra, penta, hexa, hepta and octa congeners of polychlorinated dibenzofurans at levels of from 840 to 18,000 depending on congener. PCP was used as a treatment for railroad ties. For example, the Union Pacific Railroad Tie Treating Plant in Oregon treated wood with ammoniacal copper arsenate, creosote, a creosote/fuel oil mixture, and pentachlorophenol. Site contaminants at that site included PCP and arsenic (EPA, 1990). Incomplete combustion of PCBs can produce dioxins and furans.

Due to their hydrophobic nature and resistance toward metabolism, dioxins and furans have been found in fatty tissues of animals and humans. Several PCDDs and PCDFs have been shown to cause toxic responses similar to those caused by 2,3,7,8-TCDD which is considered the most potent of the congeners. The toxic responses include dermal toxicity, immunotoxicity, carcinogenicity and adverse effects on reproduction, development and endocrine functions (WHO, 1998). To facilitate both ecological and human risk assessment the WHO assembled a panel of experts to develop "Toxic Equivalency Factors (TEFs)" which are applied to the specific congeners to provide "Toxic Equivalents (TEQs)" to 2,3,7,8-TCDD. The TEFs were developed for Humans/Mammals, Fish and Birds due to the varied toxic response by the receptor groups. In 2005 WHO updated the TEF tables modifying some TEFs. The TEQs are illustrated in Table 1. Bioconcentration factors reported by EPA (1999) were 1.59 soil-to-soil invertebrate, .0056 soil to plant, 1,560 water to aquatic plant, 3,302 water to algae, 4,235 water to fish and 19,596 sediment to benthic invertebrates.

The high likelihood that the dioxins and furans remain in the fatty tissues of the host organism results in bioaccumulation of the contaminants in the host which will ultimately be passed on to upper trophic level predators in a process called biomagnification. This places high trophic level predators like fish, bears, marine mammals, eagles and humans that feed on the prey at the greatest risk. As such, compounds at sub-detectable levels in environmental media can be found at high levels in upper trophic level organisms.

To determine the expected concentration of 2,3,7,8-TCDD the bioconcentration factor can be multiplied by a food chain multiplier. For example, a sediment to benthic organism BCF of 19,596 would be multiplied by a FCM of 27 (based on a K_{ow} =6.8) for a biomagmification of 529,092 to a upper trophic level 4 receptor. The TEQs were calculated for humans/mammals, fish and birds. Samples collected at SWAPE S-5 (7/07) identified 2,3,7,8-TCDD equivalents of 592.72 for humans/mammals, 498.67 for fish and 424.02 for birds. The human/mammal TEQ is typically reported by laboratories and is typically used for general comparison for other receptors. As such, SWAPE S-5 (7/07), which is located in freshwater emergent/brackish marsh wetland, exceeds the UET by for freshwater by 67 times and the marine sediment AET by 164 times. TEQs at the three sites (S-1, S-5, and S-6 (7/07)) ranged from 216.6 to 592.72. WHO (2006) revised some TEFs values, however, when recalculated the total TEQs were not significantly changed so the 1998 values were used. The results of the Janaury 10, 2008 sampling event are shown in Exhibit D along with calculated TEQs. (The laboratory reported the SWAPE January 10, 2008 results using the updated 2006 TEFs which did not significantly change the results when compared to the 1998 TEFs.) All three SWAPE 2007 samples and all of the SWAPE 2008 samples exceeded the freshwater UET. Samples SWAPE S-5 (7/07), in the freshwater emergent/brackish marsh wetland, and the SED 1 (1/08) and SED 2 (1/08) which lie in brackish marsh wetland, exceed the marine AET. The SWAPE 2008 sample in Clark Slough just below the west ditch outfall (SWAPE SED 2 (1/08)) had a TEQ of 1027.44 pg/g exceeding the freshwater UET by 116 times. The sample taken in Clark Slough down gradient had a TEQ of 20.78 and the sample at the Humboldt Bay/Clark Slough confluence had a TEQ of 40.198. Samples taken by the City of Eureka (2005) in the Small Boat Basin near the confluence reported TEQs of 3.74 and 2.57 pg/g. Geomatrix (2007) reported a maximum TEQ of 11.7pg/g for Humboldt Bay. The sample SWAPE SED 2 (1/08) is two orders of magnitude above the Humboldt Bay maximum TEQ.

Considering high concentrations of the dioxins and furans at the site and the potential for biomagnification up the food chain, the contaminant poses extreme risk to upper trophic level receptors. These receptors would include the terrestrial and aquatic predators such as the river Otter, Salmon, trout, birds of prey, the raccoon, and marine mammals. Of additional concern is the high levels of total TCDD, HpCDD, TCDF, PeCDF, HxCDF and HpCDF which serve as a cumulative reservoir for future degradation and dehalogenation of those congeners into more toxic products.

Step 4: Risk Characterization

Contaminated sediments at the Balloon Track pose an imminent and substantial endangerment and risk of harm to ecological receptors at all trophic levels on site, and pose an imminent and substantial endangerment and substantial risk of harm to off-site receptors due to the potential for physical transport of those sediments into Clark Slough and ultimately into Humboldt Bay. While the contaminants pose a substantial endangerment as single contaminants, the additive effects of such as 2,3,7,8-TCCD and PCB 1260 and the additive effects of the heavy metals pose additional risk to the receptors. Additional site characterization is needed to determine the source areas and vertical and lateral extent of the contamination. Once this characterization takes place, a detailed ecological risk assessment should be completed.

Submitted under penalty of perjury, this 29th day of January, 2008.

William J. Rogers

William J. Rogers PhD, CHMM

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Table 1. Toxicity Equivalency Factors and 2,3,7,8-TCDD Dioxin Equivalents

	WHO 1998			SWAPE S-1 (7/07)				SWAPE S-5 (7/07)				SWAPE S-6 (7/07)			
	Tef M/H	TEF Fish	TEF Bird	Data	TEQM/H	TEQFish	TEQBird	Data	TEQM/H	TEQFish	TEQBird	Data	TEQM/H	TEQM/H	TEQBird
2,3,7,8-TCDD	1	1	1	44	44	44	44	40	40	40	40	62	62	62	62
Total TCDD		0	0	440	0	0	0	350	0	0	0	400	0	0	0
1.2.3.7.8-PeCDD	1	1	1	43	43	43	43	110	110	110	110	61	61	61	61
Total PeCDD		0	0	490	0	0	0	760	0	0	0	480	0	0	0
1,2,3,4,7,8-HxCDD	0.1	0.5	0.05	76	7.6	38	3.8	370	37	185	18.5	190	19	95	9.5
1,2,3,6,7,8-HxCDD	0.1	0.01	0.01	210	21	2.1	2.1	790	79	7.9	7.9	430	43	4.3	4.3
1,2,3,7,8,9-HxCDD	0.1	0.01	0.1	150	15	1.5	15	280	28	2.8	28	250	25	2.5	25
Total HxCDD		0	0	1600	0	0	0	6500	0	0	0	3500	0	0	0
1,2,3,4,6,7,8-HpCDD	0.01	0.001	0.001	4000	40	4	4	16000	160	16	16	10000	100	10	10
Total HpCDD		0	0	7000	0	0	0	23000	0	0	0	19000	0	0	0
OCDD	0.0001	0.0001	0.0001	25000	2.5	2.5	2.5	130000	13	13	13	67000	6.7	6.7	6.7
2,3,7,8-TCDF	0.1	0.05	1	29	2.9	1.45	29	35	3.5	1.75	35	41	4.1	2.05	41
Total TCDF		0	0	250	0	0	0	320	0	0	0	280	0	0	0
1,2,3,7,8-PeCDF	0.05	0.05	0.1	19	0.95	0.95	1.9	48	2.4	2.4	4.8	38	1.9	1.9	3.8
2,3,4,7,8-PeCDF	0.5	0.5	1	28	14	14	28	62	31	31	62	46	23	23	46
Total PeCDF		0	0	540	0	0	0	730	0	0	0	590	0	0	0
1,2,3,4,7,8-HxCDF	0.1	0.1	0.1	70	7	7	7	270	27	27	27	190	19	19	19
1,2,3,6,7,8-HxCDF	0.1	0.1	0.1	42	4.2	4.2	4.2	100	10	10	10	71	7.1	7.1	7.1
2,3,4,6,7,8-HxCDF	0.1	0.1	0.1	38	3.8	3.8	3.8	66	6.6	6.6	6.6	40	4	4	4
1,2,3,7,8,9-HxCDF	0.1	0.1	0.1	0	0	0	0	12	1.2	1.2	1.2	5.8	0.58	0.58	0.58
Total HxCDF		0	0	1300	0	0	0	4600	0	0	0	2700	0	0	0
1,2,3,4,6,7,8-HpCDF	0.01	0.01	0.01	1000	10	10	10	4000	40	40	40	2400	24	24	24
1,2,3,4,7,8,9-HpCDF	0.01	0.01	0.01	46	0.46	0.46	0.46	310	3.1	3.1	3.1	150	1.5	1.5	1.5
Total HpCDF		0	0	2900	0	0	0	9000	0	0	0	7700	0	0	0
OCDF	0.0001	0.0001	0.0001	1900	0.19	0.19	0.19	9200	0.92	0.92	0.92	4500	0.45	0.45	0.45
Total TEQ					216.6	177.15	198.95		592.72	498.67	424.02		402.33	325.08	325.93

Photo 1. Oil sheen on west ditch.

Photo 2. Residue in large open tank.

Photo 3. Leaking heavy oil substance from tank.

Photo 4. Railroad tie pile and den habitat

List of Exhibits:

- **Exhibit A: Vitae William J. Rogers**
- **Exhibit B: CEA Table 7. Analytical Results Summary-Sediment July 12, 2000 Sampling Event**
- **Exhibit C: CEA Table 6. Analytical Results Summary-Sediment July 30, 2007 Sampling Event.**
- **Exhibit D: Laboratory results January 10, 2008 Sampling Event**
- **Exhibit E: Sampling Locations Map for July 30, 2007 Sampling**
- **Exhibit F: Sampling Location Map for January 10, 2008 Sampling**

The above exhibits, as well as the tables in the maybe used to summarize or support my opinions. Photographs taken during the January 10, 2008 site visit and photo log may also be used to support my opinions.

Exhibit A. Vitae of William J. Rogers

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AREAS OF EXPERTISE

Ecological Risk Assessment and Ecological Toxicology
Aquatic and Terrestrial Environmental Sampling and Analysis
NEPA Management- EA, EIS Preparation and Public Involvement
Endangered Species Act Consultation, Assessment and Survey
Wetland Delineation

RESEARCH INTERESTS

Ecological Risk Assessment, water development, agricultural and industrial related natural resource and environmental quality issues. Focus areas: Water quality heavy metals, environmental compliance, environmental assessment decision support modeling, environmental risk modeling, toxicology, environmental remediation, waste management and handling.

EDUCATION

1999 Ph.D. Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas

Dissertation: Development and Application of the Weight-of-Evidence Ecological Risk Assessment Model

1976 M.S. Biology, West Texas State University, Canyon, Texas

Thesis: A Biotelemetry Study of Winter Activity Patterns of Scaled Quail (*Callipepla squamata*) in the Texas Panhandle

1974 B.S. Biology, West Texas State University, Canyon, Texas

CERTIFICATIONS

Certified FWS Instreamflow (IFM)
Certified Habitat Evaluation (HEP)
Certified Hazardous Materials Manager, Institute of Hazardous Materials Management #1694 Masters Level

1988 - Instructor OSHA 40-hr Hazardous Waste Site Worker, 8-hr Annual Refresher and 8-hr Supervisors Training.

Professional Affiliations

Interagency Playa Lake Disease Council, 1985-1987
Institute of Hazardous Materials Management (Current)
Academy of Hazardous Materials Management (Current)
Society of Environmental Toxicologists and Chemists (Current)
Air and Waste Management Association (Current)
Chemical Manufactures Advisory Board on Persistent Toxic Bioaccumulators 1998-1999.

PROFILE OF PROFESSIONAL ACTIVITIES

Director of West Texas A&M University Environmental Science Program, Associate Professor in Life, Earth and Environmental Sciences, and senior researcher. Senior World Bank and United Nations Environmental Program advisor on global environmental issues in Russia and post-Soviet Republics Romania, and Azerbaijan. Developed and currently expanding a "Spatial Weight-of Evidence Ecological Risk Assessment Model" to integrate and quantify observed and predicted human and ecological effects at development, construction, contaminated and disturbed sites. Developed ecological cleanup standards and computer model "Protective Cleanup Levels (PCL) Generator" for Texas Commission on Environmental Quality. This database will be listed on the TCEQ web site and provides PCL's for over 109 chemicals, in four habitats for over 80 species of receptors as well as a user interactive tool to conduct ecological risk assessments. Developed the ecological risk assessment protocol for the Department of Energy Savannah River Plant. Served as the Southwestern Coordinator on the Secretary of Interior's Task Force on Selenium and Other Toxic Substances evaluating surface water and irrigation return flows in Texas, New Mexico, Oklahoma and Colorado. Senior Program Manager, specializing in the area of risk-based closure of complex environmental restoration sites and in the evaluation and modeling of environmental risk including human and ecological risk. Managed the ecological risk assessment for the Department of Energy Oak Ridge, East Fork Poplar Creek Ecological Risk Assessment addressing 150 ton mercury release as well as other heavy metals including cadmium and chromium.

Over 30 years experience in virtually all aspects of environmental risk assessment, restoration, and protection. Managed and prepared large scale, controversial environmental impact statements, directed public-involvement programs, and developed environmental regulation compliance strategies for projects in seven southwestern states and six EPA regions.

Served on the Bureau of Reclamations director's staff in water development and planning. Managed over 30 water development and restoration projects in Texas, Oklahoma, New Mexico, Colorado and Kansas. Managed and prepared over 100 Endangered Species Act Section 7c consultations, National Environmental Policy Act documents. Conducted over

30 jurisdictional wetland delineations, preconstruction consultations, and coordination with the appropriate USACE Regional Engineer.

Deputy Division Manger Waste Management and Environmental Restoration at the Pantex Nuclear Weapons Plant overseeing a $140 million dollar environmental planning and restoration program. Managed multi-disciplinary technical teams and directed large scale environmental projects on highly visible projects such as the Deaf Smith High Level Repository, Yucca Mountain High Level Repository, Nevada Test Site, Savannah River, Oak Ridge, Rocky Flats, White Sands, Los Alamos, and numerous water development projects.

SUMMARY OF PROFESSIONAL EXPERIENCE

West Texas A&M University, Canyon, Texas (1997-Present)

Director Environmental Science Program, researcher, Associate Professor in Life, Earth and Environmental Sciences and technical consultant to the World Bank and United Nations on environmental pollution, remediation, risk and global environmental sustainability. Developed ecological cleanup standards and computer model "Protective Cleanup Levels (PCL) Generator" for Texas Commission on Environmental Quality. This database will be listed on the TCEQ web site and provides PCL for over 109 chemicals, in four habitats for over 80 species of receptors. Providing technical support to the U.S. Department of Energy, Pantex Plant (the Nation's only nuclear weapons fabrication and maintenance plant, in implementation of risk-based remediation and closure of hazardous waste sites. Technical support on Firing Site 5 Human Health Risk Assessment and Air Dispersion of Uranium and other Heavy metals. Engaged in environmental projects in Azerbaijan, Russian, Romania, Texas, Kansas, and Colorado working closely with regional and international scientists. Currently the World Banks technical advisor and lead on one of the world's largest mercury cleanups, construction of the Republics first hazardous waste landfill and the redrafting of their environmental regulations to international standards in post-soviet Azerbaijan.

Battelle Memorial Institute, Amarillo, Texas (1996-1997)

Served as Senior Program Manager and Battelle representative on the Chemical Manufactures Association Committee on endocrine disruptors and persistent toxic bioaccumulators. Provided technical support to large corporate clients such as Allied Signal and Honeywell in the area of risked-based site cleanup and closure and well as strategic environmental planning. Member, Battelle Pacific Northwest Laboratory working committee on the expansion of the Battelle developed Multimedia Environmental Pollutant Assessment System (MEPAS) to integrate ecological assessment endpoints into the model resulting in a fully integrated human health and ecological risk assessment modeling tool.

Battelle Memorial Institute, Amarillo, Texas (1993-1996)

Department Manager, Environmental Restoration at the U.S. Department of Energy, Pantex Plant. Managed a program budget of $144 million and an annual budget of over $30 million and a direct staff of over 40 technical personnel. Managed all aspects of the Environmental Restoration Program, including technology development, innovative site characterization methodologies, and in situ remediation alternatives.

Science Applications International Corporation, San Antonio, Texas (1988 - 1993)

Deputy Operations Manager and led technical project management and environmental business development with annual office revenues in excess of $30 million. Program manager for the DOE East Poplar Creek Ecological Risk Assessment. Developed Ecological Risk Assessment Protocols for the DOE Savanna River Plant. Program manager of a $6.9 million-per-year environmental support contract to the TVA. Environmental Services Manager responsible for innovative technology and program development, project management, and client interface. Staffed and managed an office of 160 personnel. Provided quality assurance support to EG&G Rocky Flats in support of environmental programs at the site. Project Manager for the Rocky Flats Site Wide Quality Assurance Project Plan for CERCLA RI/FS and RCRA FI/CMS Activities.

Senior environmental scientist assigned to the Yucca Mountain Project (planned underground high-level nuclear waste repository). Developed Yucca Mountain hazardous materials management and handling program (the first of its kind), which addressed federal, state, and DOE Order requirements.

Battelle Memorial Institute, Amarillo, Texas (1987 - 1988)

Regulatory compliance specialist on the proposed Deaf Smith County nuclear-waste repository project. Technical reviewer for DOE in the areas of environmental compliance and technical merit of site characterization study plans.

U.S. Department of Interior - Bureau of Reclamation, Amarillo, Texas (1985 - 1987)

Director's Staff - Regional Environmental Specialist accountable for environmental compliance and programs for a five-state area. Managed over 30 water development and restoration projects in Texas, Oklahoma, New Mexico, Colorado and Kansas. Served as the southwestern coordinator on the Secretary of Interior's Task Force on Selenium and Other Toxic Substances in surface water and irrigation return flows in Texas, New Mexico, Oklahoma and Colorado. Managed and prepared over 100 Endangered Species Act Section 7c consultations, National Environmental Policy Act documents. Accountable for regional hazardous waste and emergency response programs. Developed the Bureau-wide "Regional Hazardous Materials Management and Contingency Plan" for Bureau water development projects and operations.

U.S Department of Interior -Bureau of Reclamation (1979 - 1985)

Regional Environmental Specialist and Biologist for project planning and development. Responsible for NEPA and executive order compliance and managed the preparation of environmental assessments, impact statements, and endangered species assessments. Responsible for assessment of instreamflow requirements for proposed and ongoing water development projects, interface with state, federal and local officials, Endangered Species Act Section 7c consultation, habitat evaluation and mitigation, Natural Resource Damage Assessment.

Petrolite Corporation, Great Bend, Kansas (1977 - 1979)

Field Scientist/engineer responsible for development and field-testing of chemical treatments for fresh- and salt-water problems in oil production and industrial applications. Including water quality and thermal pollution.

Copyrights

William J. Rogers. Development and application of an integrated model for ecological risk assessment-employing the spatial habitat equivalency method. Copyright TX5-158-309, 2000.

William J. Rogers. Ecological Protective Cleanup Level (PCL) User Interactive Generator. In process.

PUBLICATIONS

Over 40 published papers, 1 book and 3 book chapters, editor Encyclopedia of Water Science.

SELECTED PUBLICATIONS

Seong-gi Moon, Brent Auverman and William J. Rogers. Open-Path Transmissometry to determine Atmospheric Extinction of Feedyard Dust, Transactions of the ASAE (2006)

Parker, D.B., J.S. Posey, D.L. Williams, N.A. Cole, **W.J. Rogers**, D.W. Auverman. Biogas production using high solids beef cattle manure in geomembrane lined cells. Transactions of the ASAE (2006)

Swartz C. D., K.C. Donnelly, Arif Islamzadey, Gilbert T. Rowe|, **William J. Rogers**, Grigoriy M. Palatnikov, Rafik Kasimov, Thomas J. McDonald, Jeffery K. Wickliffe and John W. Bickham. 2003. Chemical contaminants and their effects in fish and wildlife from the industrial zone of Sumgayit, Republic of Azerbaijan. Ecotoxicology 12:511-523.

Bickham J. W., C. W. Matson, A. Islamzadey, G. T. Rowe, K. C. Donnelly, C. D. Swartz, **W. J. Rogers**, R. L. Autenrieth, T. J. McDonald, D. Politov, J. K. Wickliffe, G. Palatnikov, A. A. Mekhtiev, and Rafik Kasimov. 2003. Editorial: The unknown environmental tragedy in Sumgayit, Azerbaijan. Ecotoxicology 12:507-510.

Parker, D.B., J.S. Posey, D.L. Williams, N.A. Cole, **W.J. Rogers** and B.W. Auverman. 2001. Psychrophilic biogas production using high solids aged beef cattle manure. Transactions of the ASAE.

Theodorakis, C. W., C. D. Swartz, **W. J. Rogers**, J. W. Bickham, K. C. Donnelly, and S. M. Adams. 2000. Relationship between genotoxicity, mutagenicity, and fish community structure in a contaminated stream. Journal of Aquatic Ecosystem Stress and Recovery, 7:131-143.

Bickham, J. W., G. T. Rowe, G. Palatnikkov, A. Mekhtiev, M. Mekhtiev, R. Yu. Kasimov, D. W. Hauschultz, J. K. Wickliffe, and **W. J. Rogers**. 1998. Acute and genotoxic effects of Baku Harbor sediment on Russian sturgeon, *Accipenser guildensteidti*. Bulletin: Environmental Contamination and Toxicology. 61:512-518.

Rogers, W. J., and J. W. Bickham. 1998. Spatial weight-of-evidence ecological risk assessment driven resource allocation. Proceedings of the American Nuclear Society, Topical Meeting on Risk-based Performance Assessment and Decision Making, Richland/Pasco, WA, 180-186. (Risk committee reviewed and invited Paper)

Bickham, J. W., W. J. Rogers, and C. W. Theodorakis. 1998. Transgenerational genetic effects of environmental contamination: Implications for risk assessment. Proceedings: American Nuclear Society, Topical Meeting on Risk-based Performance Assessment and Decision Making, Richland/Pasco. WA. 187-194. (Risk committee reviewed and invited Paper)

Wells, F., Jackson, G., and Rogers, W. J. 1987. Field screening and assessment of irrigation drainage in the Lower Rio Grande Valley and Laguna Atascosa National Wildlife Refuge. Texas: U.S. Geological Survey Water Resources Investigations Report. (Reviewed the National Academy of Science special committee to the Secretary of Interior).

Killebrew, Flavius C., William J. Rogers and Joel B. Babitzke. 2002. Assessment of instream flow and habitat requirements for Cagle's Map Turtle (Graptemys caglei), Report to the Texas Parks and Wildlife and U.S. Fish and Wildlife Service Guadalupe River Instream Flow Working Group and the Edwards Aquifer Authority, Contract #00-52-AS. 61 pp.

Rogers, William J., author. 2002. Component C: Risk Reduction of Water Pollution in Maramures Region, Initial Project Information Document (PID): Romania-Hazard Risk Mitigation and Emergency Preparedness Project" Report on behalf of the World Bank to the Government of Romania Ministry of Public finance, February 2002.

Auverman, Brent W. and W. J. Rogers, "Documented Human Health Effects of Airborne Emissions from Intense Livestock Operations" Technical Paper submitted to the Canadian Intense Livestock Working Group, Lacombe, AB December 18, 2000.

Rogers, William J., "Risk Assessment-Defining the Field", Paper presented to the Agricultural Medicine and Rural Health Workshop, Texas Tech University Health Sciences Center, Amarillo, Texas, December, 15, 2000.

Rogers, William J., 2001. Distance Education as a Tool for Environmental Education in Post Soviet Education Reform. World Bank Global Development Learning Network Forum, Washington D.C.

Rogers, William J., and David B. Parker, 1999. Comparative study of coliforms and animal waste indicators on two watersheds. McClean Feeders. McClean, Texas.

Rogers, William J., 1999. Editor and author. Pantex Plant: Baseline Risk Assessment for the U.S. Department of Energy Pantex Plant, Amarillo, Texas-Summary.

Dual-Phase Liquid and Vapor Treatment System, W. J. Rogers and Johnny Weems, Proceedings DOE Pollution Prevention in the 21st Century, Conference XII, July 9-11, 1996.

EPA RAGS II

Yucca Mountain Project, Hazardous Materials Management and Handling Program, Author for U.S. Department of Energy, 1989 (draft).

Electronic Combat Training Capability, Utah Training and Testing Range, 1989, Draft Environmental Impact Statement for the U.S. Air Force: Deputy Project Manager, Biological Resources Principal Investigator.

Endangered Species Biological Assessment, Electronic Combat Training Capability Project for U.S. Air Force, Project Manager/Author, 1989.

Aircraft Low Level Supersonic Noise Evaluation for U.S. Air Force, Co-Author, 1989.

Velarde Community Ditch Project, Phase II, Finding of No Significant Impact, 1987: Project Manager/Co-Author, U.S. Department of Interior.

San Angelo Safety of Dams Project, Environmental Assessment, 1987, Project Manager/Co-Author, U.S. Department of Interior.

Buffalo Lake National Wildlife Refuge Environmental Assessment, 1985, Project Manager/Co-Author, U.S. Department of Interior.

Colorado Coastal Plains Environmental Impact Statement, 1985, Co-Author, U.S. Department of Interior.

Lake Meredith Salinity Control Project Assessments, 1985, Co-Author/Environmental Studies Project Manager, U.S. Department of Interior.

Velarde Environmental Assessment, Finding of No Significant Impact, 1984, Project Manager/Author, U.S. Department of Interior.

Tularosa Basin Water Use Study, 1984, Co-Author, U.S. Department of Interior.

Rogers, W. J., 1983, Llano Estacado Environmental Assessment, 1983, Project Manager/Co-Author, U.S. Department of Interior.

Rogers, W. J., Estacado Playa Lakes - An Environmental Perspective, 1983, U.S. Department of Interior.

Santa Cruz Dam Project, Finding of No Significant Impact, 1983, Project Manager/Co-Author, U.S. Department of Interior.

Endangered Species Assessment, Gallup-Navajo Water Supply Project, 1983, Project Manager/Author, U.S. Department of Interior.

Gallup-Navajo Water Supply Project Environmental Impact Statement, 1982, Co-Author, U.S. Department of Interior.

Wilburton Reservoir Environmental Assessment, 1982, Project Manager/Author, U.S. Department of Interior.

Provo Municipal Airport Runway Improvement Project Draft Environmental Assessment, 1991, Co-Author, Deputy Project Manager for City of Provo, Utah.

Rocky Flats Plant Site-Wide Quality Assurance Project Plan for CERCLA Remedial Investigations/Feasibility Studies And RCRA Facility Investigations/Corrective Measures Studies Activities, 1990, for EG&G Rocky Flats Plant, Colorado, Project Manager.

Environmental Regulatory Overview Manual and Training Course for International Right of Way Association, 1990, Author.

East Fork Poplar Creek Ecological Assessment Methods Plan, 1991, for Martin-Marietta, Oak Ridge, Tennessee, Project Manager.

Ecological Risk Assessment Program Plan for Evaluation of Waste Sites on the Savannah River Site, 1992, for Westinghouse Savannah River Company, Co-Author/Project Senior Scientist.

City of Provo Wetlands Masterplan. 1992. City of Provo. Project Manager.

Quality Assurance Plan for Lima Stratigraphic Test Well, 1991, for BP Chemicals, Inc., Project Manager.

Lima Stratigraphic Test Well Technical Report and No-Migration Petition, 1992, for BP Chemicals, Inc. Co-Author.

EPA Data Quality Objectives Training and Orientation, 1991 for EG&G Rocky Flats Plant, Author and Trainer.

Ecological Risk Assessor's Guide for Evaluation of Waste Units on the Savannah River Site, 1993, Principal Co-Author, Project Leader.

Critical Comments on the U.S. Environmental Protection Agency Standards 40 CFR 191. Contributor 1993. Technical Paper presented to the Department of Energy Office of Environment, Safety and Health. Washington D.C.

Meeting and Technical Papers Presented

Monroe, M. R., **W. J. Rogers** and D.B. Parker. 2004. Evaluation of stream sampling methodologies for fecal coliform bacteria. ASAE Biological and Environmental Sciences Annual meeting. Ottawa, Canada. Paper No. 04-4071 (Paper and Poster)

Hartley, Richard S. Ph.D., P.E., **William J. Rogers, Ph.D**., Dennis E. Huddleston, Jeffrey R. Flowers, Martin R. Amos, and Michael O'Connell. 2004. Strategy and model for accelerated closure and long-term environmental stewardship. Proceedings Department of Energy Waste Management 2004 Conference. Tucson, AZ.

Rogers, William J. 2003. Teaching environmental sciences-a tuition paid opportunity for area teachers. Texas Annual Panhandle Area Mathematics and Science Conference, West Texas A&M University, Canyon, Texas, September 27, 2003.

Buchanan, J.D. D.B. Parker, M.B. Rhoades, J. Koziel and **W. J. Rogers**. 2003. Assessment of moisture control and additives for odor reduction form open-lot feedyard surfaces. ASAE Paper No. 03-4140.

Rogers William J., Sloan Wendall, Danny Bowman. 2002. The influence of agricultural landuse on organchlorine pesticide persistence in soils and potential transport. Proceedings: Texas Academy of Science, 105th Annual Meeting, February 28-March 2, 2002. (Paper and presentation)

Parker, D.B., J. S. Posey, D. L. Williams, N. A. Cole, **W. J. Rogers**, B.W. Auvermann. 2002. Psychrophilic biogas production using high solids aged beef cattle manure. Transactions of the ASAE, July, 2002) Paper and Poster.

Parker, D.B., D.L. Williams, N.A. Cole, B.W. Auverman and **W.J. Rogers**. 2002. Dry nonheated anaerobic biogas fermentation using aged beef cattle manure. ASAE Paper No. 02-4142. Presented at the 2002 ASAE International Meeting, Chicago, Illinois, July 28-31, (Poster presentation)

Parker, D.B., J.E. Cahoon, **W.J. Rogers**, M.B. Rhoades, M.C. McCullough and C. Robinson. 2001. Infiltration characteristics of cracked clay soils in bottoms of feedyard playa catchments. ASAE Paper No. 01-2281. Proceedings 2001 ASAE International Meeting, Sacramento, California. (Paper and Poster presentation).

Rogers, William J., 2001. Distance education as a tool for environmental education in post-Soviet education reform. World Bank global development learning network forum. Washington D.C. (**Invited Speaker**)

Auverman, Brent W. and **W. Jim Rogers**. 2000. Documented human health effects of airborne emissions from intensive livestock operations. Proceedings: Workshop, Industry Services Alberta Pork and Intensive Livestock Working Group. Lacombe, AB December 18, 2000.

Rogers, William J., 2000. Risk assessment-defining the field. Paper presented to the Agricultural Medicine and Rural Health Workshop, Texas Tech University Health Sciences Center, Amarillo, TX. December, 15, 2000.

Purkiss, Chris, **Jim Rogers** and George Mann. 2000. You can't have a policeman by every tree: The need to integrate environmental education into the curriculum in Azerbaijan. School Science Math Association Annual Conference. Albuquerque, New Mexico, October 20-21, 2000.

Rogers, William J., J.W. Bickham and T.M. Bolwahnn, 2000. Spatial weight-of-evidence integrated risk assessment. Society of Environmental Toxicology and Chemistry SETAC 19th Annual Meeting. Presentation and Abstract.

Mann, George, Christine Purkiss, **Jim Rogers**, and Leyla Aliyeva. 2000. Development of environmental education component for the World Bank-Government of Azerbaijan education reform project. Special Report submitted to the Azerbaijan Environmental Education Initiative Review Group. Bacu, Azerbaijan.

Bickham, John W., Christopher W. Theodorakis and **William J. Rogers.** Integration of genotoxicity, population genetics and ecological risk assessment: Kangaroo rats exposed to radionuclide contamination at a nuclear weapon test facility. The EMAP Symposium on Western Ecological Systems: Status, Issues and New Approaches. San Francisco, CA., April 6-8, 1999.

Rogers, William J. Risk assessment and natural resource damage assessment integration using spatial weight-of-evidence model: An approach to integrating natural resource damage assessment and risk assessment. 1999 South-Central SETAC Regional Meeting, Society of Environmental toxicology and Chemistry, Houston, Texas. April 12-13, 1999. **(Invited paper)**

Rogers, William J. Spatial weight-of-evidence integrated risk assessment as applied to natural resources. Texas Chapter of the Wildlife Society, Annual meeting, Amarillo, Texas, 1999.

Theodorakis, C.W., C. Swartz, **W.J. Rogers** and J.W. Bickham. 1998. Relationship between genotoxicity, mutagenicity, and community structure in a contaminated stream. Proceedings Society of Environmental Toxicology and Chemistry SETAC 19th Annual Meeting.

Technical Editing

Topical Editor- Water Analysis and Measurement. Encyclopedia of Water Science. Edited by B.A. Stewart and Terry A. Howell. Section. Dekker Publishing. Current appointment.

Topical Editor- Encyclopedia of Water Science. Edited by B.A. Stewart and Terry A. Howell. Dekker Publishing. Edited water analysis chapters, all of which were accepted published, Marcel Dekker Publishing, Inc. 2003.

Pillai, Suresh D., and George Di Giovanni. 2003. Microbial sampling. Encyclopedia of Water Science. Edited by B.A. Stewart and Terry A. Howell. Dekker Publishing. 2003. Pages 618-621. Topical Editor.

Parker, David B., and Marty Rhodes. 2003. Oxygen measurement: Biological-chemical oxygen demand. Encyclopedia of Water Science. Edited by B.A. Stewart and Terry A. Howell. Dekker Publishing. 2003. Pages 642-644. Topical Editor.

Eghball, Bahman, and Daniel H. Pote. 2003. Phosphorous measurement. Encyclopedia of Water Science. Edited by B.A. Stewart and Terry A. Howell. Dekker Publishing. 2003. Pages 666-668. Topical Editor.

Defauw, Sherri L. 2003. Wetland ecosystems. Encyclopedia of Water Science. Edited by B.A. Stewart and Terry A. Howell. Dekker Publishing. 2003. Pages 1034-1037. Topical Editor.

Mankin, Kyle R. 2003. Wetlands as treatment systems. Encyclopedia of Water Science. Edited by B.A. Stewart and Terry A. Howell. Dekker Publishing. 2003. Pages 1038-1042. Topical Editor.

Reviewer for Texas Natural Resource Conservation Commission work prepared by the Ecological Risk assessment Advisory Group in the preparation of " Ecological Risk Assessment Methodology" for the state of Texas. (Current Position)

Technical reviewer, "Pit disassembly & conversion facility-Waste characterization/waste treatment study" Department of Energy-Chicago Operations Office prepared by Raytheon Engineers and Constructors, Contract Number DE-AC02-99-CH10903, February 2001. Classified-Technical reviewer on waste issues on Plutonium Pit conversion and reuse.

Technical reviewer Azerbaijan National Environmental Action Plan, World Bank Technical Working Group, Baku, Azerbaijan, November, 1998 and revision in 1999.

World Bank mission to evaluate Russian environmental programs, World Bank Resident Mission, Moscow, January, 1999.

Professional Meetings, Workshops and Seminars Conducted

William. J. Rogers, Appala Paila, Venkata Sambara, Vipul Saxena. Development of Ecological Protective Cleanup Levels for Soil and Water. Presented to the Texas Commission on Environmental quality and the TCEQ Ecological Risk Assessment Working Group (Sept. 2005)

William. J. Rogers, Appala Paila, Venkata Sambara, Vipul Saxena. Development of Ecological Protective Cleanup Levels for Soil and Water. Presented to the United States Air Force Center for Environmental Excellence (Invited Presentation) (December 2005)

Conducted workshop for WTAMU Teachers Development Day on Teaching Environmental Science August, 2003.

Conducted workshop for Amarillo AACAL Math & Science Career Showcase, February 22, 2002.

Ecological Risk Assessment Workshop. Baku, Azerbaijan in 2005 sponsored by the Azerbaijan Ministry of Environment and BP Oil Company.

Review of Wichita State University's "Environmental Science Program" as a subject expert and to make recommendations on program improvement. 2001. Invited by WSU Dean of Natural and Environmental Sciences.

Texas 2000 Initiative Working Group. Texas Natural Resource Commission. Participant and representative for the Texas High Plains. Austin, Texas. July 2000.

Ecological Risk Assessment: Methods and Current Trends. Seminar presented to the Azerbaijan National Academy of Science, Bacu Oil Academy and Bacu Research Institute funded by Amoco Oil Company. Bacu, Azerbaijan. 1999.

Grants Activity: Awarded

Firing Site 5 Human Health Risk Assessment Support Air Dispersion Modeling of Depleted Uranium. BWXT on behalf of the U.S. Department of Energy. Duration 3 months. Awarded $16,000.00.

Peer review of Pantex responses to regulatory comments-Technical evaluation of "Pantex Plant Radiological Investigation Report. William J. Rogers. BWXT Pantex Grant. Duration 9/01/04-5/30/05. Awarded $15,540.

Development of Ecological Risk Assessment Benchmarks and Protocol. Texas Commission on Environmental Quality Grant awarded to Texas Engineering Experimental Station and William J. Rogers, West Texas A&M University. I led the proposal development and will be the senior technical developer on this task that was submitted in December 2003 and awarded in February 2004. Duration 5,2004-1-2007. $250,000.00

Archeological and Endangered Species Assessment-Plant X Fiber Optic Alignment. William J. Rogers and Kim Goodin. Excel Energy. Awarded $9,000.00 May 2004.

Pantex Technical Review Advisory Board. William J. Rogers. Task Order Grant to WTAMU FY 2003 Duration: Current. Awarded $26,000 todate.

Teaching environmental science in high school. William J. Rogers. Texas Commission on Environmental Duration 5/04-8/05. Awarded $20,000.

Teaching environmental science in high school. William J. Rogers. Texas Commission on Environmental Duration 5/04-8/04. Awarded $20,000.

Teaching environmental science in high school. William J. Rogers. Texas Commission on Environmental Quality. Duration 5/03-8/03. Awarded $25,000. (This will be an annual award to support this program)

Entry level student interns for Environmental Restoration Dept." William J. Rogers and West Texas A&M University. Funded by BWXT Pantex. Duration 3/11/99 to present. The Original contract amount $352,709.20, amended 11/16/2000 adding another $133,509.00 for a contract value of $486,218.20. Additional amendments have resulted a ceiling of well over $600,000 and actual releases to WTAMU of $582,724.66. The contract has been opened to all WTAMU departments. Over $400,000 has been used for Environmental Science and Science majors.

Azerbaijan Urgent Environmental Investment Project. William J. Rogers. Funded by the World Bank. Duration F.Y. 2003/2004. Grant value $15,000.

Open-Path transmissometry to measure visibility associated with feedyard dust. Kilgore Faculty Research Grant. William J. Rogers. Duration 5/04-8/04. Awarded $3,750.

Development of strategy and model for accelerated closure and long-term stewardship. William J. Rogers and Micheal O'Connell. Department of Energy Grant $90,000.00 pending DOE approval.

Azerbaijan urgent environmental investment project" William J. Rogers. Funded by the World Bank. Duration F.Y. 2002. Grant value $15,000.

Fate and transport of atrazine herbicide in the Texas Panhandle soils and groundwater. William J. Rogers and Danny Bowman. Research funded by the Killgore Research Grant. Duration 1/2002-8/2002.
Awarded $5,565.

Documentation of rapid sealing of cracked playa soils.   David B. Parker, Joel E. Calhoun and Jim Rogers. Research sponsored by the Texas Cattle Feeders Association. Duration 8/99-12/2001. Funded: $3000.

Assessment of instream flow and habitat requirements for Cagle's Map turtle (Graptemys caglei).   Flavius Killebrew, Jim Rogers and Joel Babitzke. Research funded by the Edwards Aquifer Authority for submission to the Interagency Guadalupe Instreamflow Working Group. Duration 6/2000-6/2002. Funded $150,000.

Azerbaijan Urgent Environmental Investment Project. William J. Rogers. Additional tasks funded by the World Bank. Duration F.Y. 2001. Grant value $5000.

Azerbaijan Urgent Environmental Investment Project. William J. Rogers. Funded by the World Bank. Duration F.Y. 2001. Grant value $15,000.

Romania Natural Disaster Preparedness Project. William J. Rogers. Funded by the United Nations Food and Agriculture Organization. Duration FY 2001-2002. Honorarium value $20,000.00.

Fecal coliform bacteria in feedyard and agricultural watersheds. Kilgore Research Grant. David Parker P.I. and W.J. Rogers Co-PI. Awarded $3,880.

Literature Review: Emissions and documented human health effects of gases, particulate matter and bioaerosols emitted from intense livestock operations (ILOs)", Brent Auverman and William J. Rogers. Research funded by the Canadian Intense Livestock Operations Technical working Group, Duration 6/2000-12/2000. Funded $11,000.

Development and application of an Integrated model for ecological risk assessment-Employing the spatial habitat equivalency method. William J. Rogers. Research funded by Battelle Memorial Institute and the Department of Energy. Duration 1997-2000. Funded $25,000.

Fate and transport of atrazine herbicide in the Texas Panhandle soils and groundwater. William J. Rogers and Danny Bowman. Research funded by a Kilgore Research Grant. Duration 1/2002-8/2002. Funded $5,800

The influence of agricultural landuse on organochlorine pesticide persistence in soils and potential transport. William J. Rogers and Sloane Wendall. Research funded by a Killgore Research Grant. Duration 1/2001-9/2001. Funded $5,930.

Azerbaijan environmental education integration into Post-Soviet Education Reform Initiative. William J. Rogers, Kristine Purkiss and George Mann. Research funded by the World Bank. Duration 2/2000-12/2000. Funded $12,000.

Documentation of rapid sealing of cracked playa soils. Texas Cattle Feeders Association

David Parker, P.I. , Joel Calhoon, Montana State University and W. J. Rogers. Duration FY 2000. Funded $3000

Sumgayit soil remediation technical report. William J. Rogers. World Bank. Duration 1998-1999. Funded $18,500.

SPS Utility Nicholas environmental assessment. William J. Rogers and Roberta Speer. Southwestern Public Service. Duration 1998. Funded $5000

SPS Utility Plant X environmental assessment. William J. Rogers. Southwestern Public Service.

Duration 1998. Funded $15,000.

Exhibit B: CEA Table 7. Analytical Results Summary-Sediment July 12, 2000 Sampling Event

Table 7
Analytical Results Summary- Sediment
July 12, 2000, Sampling Event
CEA No. 07040

Sample ID	SQuiRTS - FRESHWATER	SQuiRTS - MARINE	S-1 (EASTERN DITCH)	Q	S-2 (EASTERN DITCH)	Q	S-3 (EASTERN DITCH)	Q	S-4 (EASTERN DITCH)	Q	S6 (STATION C)	Q	S7 (STATION B)	Q	S8 (SOUTHERN DITCH)	Q	S9 (WESTERN DITCH)	Q	S10 (EASTERN DITCH)	Q	S-11 (CLARK SLOUGH	Q	S-12 (CLARK SLOUGH)	Q	S-13 (CONNECTION BETWEEN CLARK SLOUGH/HUMBOLDT BAY)	Q	S-14 (DUPLICATE OF S-4)	Q
Sampling Date	**Upper Effects Threshold**	**Apparent Effects Threshold**	**7/11/2000**		**7/11/2000**		**7/11/2000**		**7/11/2000**		**7/12/2000**		**7/12/2000**		**7/12/2000**		**7/12/2000**		**7/12/2000**		**7/12/2000**		**7/12/2000**		**7/12/2000**		**7/11/2000**	
Metals - mg/kg																												
Antimony	3.000	9.3	1.7	J	0.42	UJ	**3.1**	J	1.6	J	0.46	UJ	0.92	J	0.81	J	1.4	J	1.3	J	1.1	J	2.9	J	0.7	J	1.8	J
Arsenic	17.00	35.00	**31.80**		**25.00**		**26.60**		12.40		4.80		5.60		5.40		**112.00**		6.80		3.60		10.80		2.00	J	8.00	
Barium	na	48.00	72.60		54.60		146.00		67.60		99.70		74.60		91.10		190.00		56.30		45.70	J	**87.70**	J	74.90		42.40	J
Beryllium	na	na	0.19	J	0.22	J	0.40	J	0.25	J	0.28	J	0.33	J	0.49	J	0.50	J	0.31	J	0.18	J	0.50	J	0.35	J	0.22	J
Cadmium	3.00	3.0	**3.2**		1.2		**3.7**		2.8		0.55	J	0.43	J	0.25	J	0.94	J	2.3		0.67	J	1.7	J	0.19	J	2.4	
Chromium	95.00	62.0	32.0		44.7		66.3		51.3		51.7		57.1		74.6		78.6		53.8		36.4		**80.3**		59.2		41.2	
Copper	86.00	390.0	60.6		35.3		**105.0**		47.6		39.2		35.0		32.6		**102.0**		54.2		75.6		138.0		27.0		38.5	
Lead	127.00	400.0	**145.0**		81.0		**292.0**		75.9		**649.0**		71.1		13.0		**160.0**		99.4		93.4		214.0		30.2		102.0	
Mercury	0.56	0.41	0.47	J	0.1	J	0.38	J	0.16	J	0.13	J	0.17	J	0.14	J	0.3	J	0.16	J	0.2	J	**0.46**	J	0.16	J	0.13	J
Molybdenum	na	na	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Nickel	43.00	110.0	37.6		**52.0**		**89.0**		**53.3**		**64.0**		**70.1**		**99.1**		**91.0**		**58.2**		34.8		80.0		74.9		**47.9**	
Selenium	na	1	1.2	UJ	1.1	UJ	1.6	UJ	1.2	UJ	1.2	UJ	1.3	J	1.2	UJ	1.4	UJ	1.2	UJ	1.7	J	**3.9**	UJ	**1.3**	UJ	**1.1**	U
Silver	4.50	3.1	0.15	U	0.13	U	0.2	U	0.14	U	0.15	U	0.22	J	0.15	U	0.17	U	0.14	U	0.58	J	1	J	0.16	U	0.21	J
Thallium	na	na	4.1		4.8		5.4		3.7		3.7		4.7		6.8		7.6		3.5		3.2	J	9		4.3		3.8	
Vanadium	na	57	24.2		32.9		54.8		39.7		31.3		38.8		49		69.5		45.2		27		**60.8**		42.6		32.4	
Zinc	520.00	410.0	**752.0**		324.0		**764.0**		514.0	J	255.0	J	109.0	J	82.9	J	238.0	J	506.0	J	243.0	J	**526.0**	J	66.2	J	404.0	J
Semi Volatile Organic Compounds, ug/kg																												
Benzaldehyde	na	na	74.0	J	ND		ND		320.0	J	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Phenol	48.00	130.0	440.0	UJ	**440.0**	UJ	**690.0**	UJ	**420.0**	UJ	**520.0**	UJ	**390.0**	UJ	**410.0**	UJ	**360.0**	UJ	**420.0**	UJ	ND		ND		**460.0**	J	350.0	J
4-Methylphenol	na	8.0	49.0	J	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Napthalene	600.00	230.0	240.0	J	57.0	J	110.0	J	45.0	J	ND		ND		ND		39.0	J	ND		ND		ND		ND		43.0	J
Caprolactam	na	na	ND		ND		ND		ND		ND		ND		ND		ND		ND		96.0	J	ND		ND		ND	
2-Methylnaphthalene	na	64.0	200.0	J	ND		120.0	J	90.0	J	ND		57.0	J	ND		44.0	J	ND		ND		ND		ND		84.0	J
Acenaphthylene	160.00	71.0	81.0	J	ND		ND		ND		ND		ND		ND		58.0	J	ND		ND		ND		ND		ND	
Dibenzofuran	5100	110.0	62.0	J	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Pentachlorophenol	na	17.0	210.0	J	10000.0	UJ	1700.0	UJ	1100.0	UJ	1300.0	UJ	990.0	UJ	1000.0	UJ	910.0	UJ	1100.0	UJ	1100.0	UJ	**3400.0**	UJ	**1200.0**	UJ	880.0	UJ
Phenanthrene	800	660.0	330.0	J	96.0	J	160.0	J	62.0	J	81.0	J	100.0	J	74.0	J	**140.0**	J	54.0		580.0		460.0	J	52.0	J	37.0	J
Anthracene	260	280.0	69.0	J	ND		ND		ND		ND		44.0	J	ND		66.0	J	ND		100.0	J	ND		ND		ND	
Fluoranthene	1500	1300.0	250.0	J	70.0	J	170.0	J	66.0	J	110.0	J	400.0		82.0	J	350.0	J	54.0		**1300.0**		**1300.0**	J	93.0	J	38.0	J
Pyrene	1000	2400.0	290.0	J	77.0	J	210.0	J	68.0	J	98.0	J	490.0		99.0	J	370.0		66.0	J	1300.0		1200.0	J	91.0	J	47.0	J
Chrysene	800	950.0	140.0	J	ND		ND		ND		ND		170.0	J	44.0	J	270.0	J	ND		610.0		820.0	J	66.0	J	ND	
bis(2-Ethylhexyl)phthalate	na	na	440.0	J	410.0	J	ND		420.0	UJ	520.0	UJ	ND		410.0	UJ	360.0	UJ	ND		2400.0		10000.0		500.0		350.0	UJ
4-Nitrophenol	na	1000.0	ND		ND		ND		ND		ND		ND		ND		ND		ND		**1100.0**	UJ	ND		ND		ND	
2,4-Dinitrotoluene	na	na	ND		ND		ND		ND		ND		ND		ND		ND		ND		450.0	UJ	ND		ND		ND	
Carbazole	na	na	ND		ND		ND		ND		ND		ND		ND		37.0	J	ND		84.0	J	ND		ND		ND	
Benzo(a)anthracene	500	960.0	ND		ND		ND		ND		ND		130.0	J	ND		170.0	J	ND		460.0		420.0	J	ND		ND	
Di-n-octylphthalate	na	61.0	ND		ND		ND		ND		ND		ND		ND		ND		ND		**450.0**	UJ	ND		ND		ND	
Benzo(b)fluroanthene	na	1800.0	ND		ND		ND		ND		99.0	J	140.0	J	ND		340.0	J	ND		730.0		940.0	J	64.0	J	ND	
Benzo(k)fluoranthene	13400	1800.0	ND		ND		ND		ND		ND		74.0	J	ND		95.0	J	ND		260.0	J	ND		ND		ND	
Benzo(a)pyrene	700	1100.0	ND		ND		ND		ND		ND		ND		ND		160.0	J	ND		500.0		610.0	J	ND		ND	
Indeno(1,2,3-cd)pyrene	330	600.0	ND		ND		ND		ND		ND		ND		ND		110.0	J	ND		360.0	J	**670.0**	J	ND		ND	
Benzo(g,h,i)perylene	300	670.0	ND		ND		ND		ND		ND		ND		ND		110.0	J	ND		350.0	J	**770.0**	J	ND		ND	

Bold - Greater than UET/AET
J - Estimated result. Result is less than the Reporting Limit
na - not applicable
ND - Not Detected

Table 7
Analytical Results Summary- Sediment
July 12, 2000, Sampling Event
CEA No. 07040

U - analyte was analyzed for but not detected above the sample detection limit
Data Source for S-1 to S-14, is *Preliminary Assessment Site Inspection,* CARWQCB, May 7, 2001. The report refers to these samples as "soil samples" in the Sediment Sampling Section (3.2.2)

Exhibit C: CEA Table 6. Analytical Results Summary-Sediment July 30, 2007 Sampling Event.

TABLE 6
Analytical Results Summary - Sediment
July 30, 2007, Sampling Event
CEA No. 07040

Sample ID	SQuiRTS - FRESHWATER	SQuiRTS - MARINE	S-1 (EASTERN DITCH)	Q	S-4 (STATION C)	Q	S-5 (STATION D)	Q	S-6 (STATION B)	Q	S-7 (WESTERN DITCH)	Q
Sampling Date	**Upper Effects Threshold**	**Apparent Effects Threshold**	**7/30/2007**		**7/30/2007**		**7/30/2007**		**7/30/2007**		**7/30/2007**	
Metals - mg/kg												
Antimony	3.000	9.3	2.3		3.9		3.9		1.8		2.9	
Arsenic	17.00	35.00	19.1		30.1		695.0		37.5		107	
Barium	na	48.00	90.7		296.0		460.0		140.0		106	
Beryllium	na	na	0.25		0.48		0.41		0.3		0.5	
Cadmium	3.00	3.0	2.3		4.7		1.2		0.89		1	
Chromium	95.00	62.0	114.0		81.0		54.8		64.1		73.9	
Copper	86.00	390.0	57.1		154.0		61.6		64.7		84.2	
Lead	127.00	400.0	149.0		145.0		97.2		154.0		111	
Mercury	0.56	0.41	0.22		0.21		0.21		0.17		0.24	
Molybdenum	na	na	1		5.90		6.4		3.20		2	
Nickel	43.00	110.0	62.9		81.5		101.0		64.3		85.1	
Selenium	na	1	0.4		1.1		0.9		0.37		0.63	
Silver	4.50	3.1	0.14		0.36		0.25	B	0.18		0.26	
Thallium	na	na	0.94	B	ND		ND		ND		0.13	B
Vanadium	na	57	31		62.6		58.7		47.7		66.3	
Zinc	520.00	410.0	393.0		1030.0		319.0		206.0		236	
PCBs - ug/kg												
Total PCBs	26.00	110.00	120		ND		ND		63.0		NA	
Pesticides - ug/kg												
4-4'- DDT	na	na	6.7		NA		5.2	JPG	17.0	J	NA	
4,4'-DDE	na	na	ND		NA		ND		200.0		NA	

TABLE 6
Analytical Results Summary - Sediment
July 30, 2007, Sampling Event
CEA No. 07040

Sample ID	SQuiRTS - FRESHWATER	SQuiRTS - MARINE	S-1 (EASTERN DITCH)	Q	S-4 (STATION C)	Q	S-5 (STATION D)	Q	S-6 (STATION B)	Q	S-7 (WESTERN DITCH)	Q
Sampling Date	**Upper Effects Threshold**	**Apparent Effects Threshold**	**7/30/2007**		**7/30/2007**		**7/30/2007**		**7/30/2007**		**7/30/2007**	
Dioxins/Furans, pg/g												
2,3,7,8-TCDD as TEQs	8.80	3.60	216.6		NA		592.72		402.3		NA	
Total Petroleum Hydrocarbons - mg/kg												
TPH - MO	na	na	ND	B	3700.0	G	380.0	G	ND		110	G
Volatile Organic Compounds - ug/kg												
Tetrachloroethene	450.00	na	11.00		ND		ND		ND		ND	
Toluene	5000.00	na	43.00		ND		240.0		ND		ND	
Semi Volatile Organic Compounds, ug/kg												
Benzaldehyde	na	na	ND		NA		ND		ND		ND	
Phenol	48.00	130.0	ND		NA		ND		ND		ND	
4-Methylphenol	na	8.0	ND		NA		ND		ND		ND	
Napthalene	600.00	230.0	ND		NA		ND		ND		ND	
Caprolactam	na	na	ND		NA		ND		ND		ND	
2-Methylnaphthalene	na	64.0	ND		NA		ND		ND		ND	
Acenaphthylene	160.00	71.0	ND		NA		ND		ND		ND	
Dibenzofuran	5100	110.0	ND		NA		ND		ND		ND	
Pentachlorophenol	na	17.0	ND		NA		ND		ND		ND	
Phenanthrene	800	660.0	ND		NA		ND		ND		ND	
Anthracene	260	280.0	ND		NA		ND		ND		ND	
Fluoranthene	1500	1300.0	ND		NA		ND		ND		ND	
Pyrene	1000	2400.0	ND		NA		ND		ND		ND	
Chrysene	800	950.0	ND		NA		ND		ND		ND	
bis(2-Ethylhexyl)phthalate	na	na	ND		NA		ND		ND		ND	
4-Nitrophenol	na	1000.0	ND		NA		ND		ND		ND	
2,4-Dinitrotoluene	na	na	ND		NA		ND		ND		ND	
Carbazole	na	na	ND		NA		ND		ND		ND	
Benzo(a)anthracene	500	960.0	ND		NA		ND		ND		ND	
Di-n-octylphthalate	na	61.0	ND		NA		ND		ND		ND	

TABLE 6
Analytical Results Summary - Sediment
July 30, 2007, Sampling Event
CEA No. 07040

Sample ID	**SQuiRTS - FRESHWATER**	**SQuiRTS - MARINE**	**S-1 (EASTERN DITCH)**	**Q**	**S-4 (STATION C)**	**Q**	**S-5 (STATION D)**	**Q**	**S-6 (STATION B)**	**Q**	**S-7 (WESTERN DITCH)**	**Q**
Sampling Date	**Upper Effects Threshold**	**Apparent Effects Threshold**	**7/30/2007**		**7/30/2007**		**7/30/2007**		**7/30/2007**		**7/30/2007**	
Benzo(b)fluroanthene	na	1800.0	ND		NA		ND		ND		ND	
Benzo(k)fluoranthene	13400	1800.0	ND		NA		ND		ND		ND	
Benzo(a)pyrene	700	1100.0	ND		NA		ND		ND		ND	
Indeno(1,2,3-cd)pyrene	330	600.0	ND		NA		ND		ND		ND	
Benzo(g,h,i)perylene	300	670.0	ND		NA		ND		ND		ND	

Bold - Greater than UET/AET
B - Analyte found in associated blank and sample
RLA - The reporting limit for this analyte is elevated due to sample dilution
NA - Not Analyzed
na - not applicable
ND - Not Detected
J - Estimated result, Result is less than the Reporting Limit
PG - The percent difference between the original and confirmation analyses is greater than 40%
U - Analyte was analyzed for but not detected above the sample detection limit
Data Source for S-1 to S-14, is *Preliminary Assessment Site Inspection,* CARWQCB, May 7, 2001. The report refers to these samples as "soil samples" in the Sediment Sampling Section

Exhibit D: Laboratory results January 10, 2008 Sampling Event

Soil Water Air Protection Enterprise

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: SED 1

Lot-Sample #...:	G8A110301 - 001	**Work Order #...:**	KFFMP1AC	**Matrix....:**	SOLID
Date Sampled...:	01/10/08	**Date Received..:**	01/11/08	**Instrument:**	9D5
Prep Date......:	01/15/08	**Analysis Date..:**	01/21/08	**Units.....:**	pg/g
Prep Batch #...:	8015247	**Dilution Factor:**	1	**% Moisture:**	26

PARAMETER	RESULT		DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	**1.2**			**1**	**1.200**
Total TCDD	**50**				
1,2,3,7,8-PeCDD	**5.6**			**1**	**5.600**
Total PeCDD	**82**				
1,2,3,4,7,8-HxCDD	**9.8**			**0.1**	**0.980**
1,2,3,6,7,8-HxCDD	**21**			**0.1**	**2.100**
1,2,3,7,8,9-HxCDD	**24**			**0.1**	**2.400**
Total HxCDD	**220**				
1,2,3,4,6,7,8-HpCDD	**430**			**0.01**	**4.300**
Total HpCDD	**850**				
OCDD	**2800**	**E**		**0.0003**	**0.840**
2,3,7,8-TCDF	**1.8**	**CON**		**0.1**	**0.180**
Total TCDF	**38**				
1,2,3,7,8-PeCDF	**2.0**	**J**		**0.03**	**0.060**
2,3,4,7,8-PeCDF	**2.4**	**J**		**0.3**	**0.720**
Total PeCDF	**43**				
1,2,3,4,7,8-HxCDF	**9.1**			**0.1**	**0.910**
1,2,3,6,7,8-HxCDF	**4.4**			**0.1**	**0.440**
2,3,4,6,7,8-HxCDF	**2.6**	**J**		**0.1**	**0.260**
1,2,3,7,8,9-HxCDF	ND		0.27	0.1	0
Total HxCDF	**120**				
1,2,3,4,6,7,8-HpCDF	**68**			**0.01**	**0.680**
1,2,3,4,7,8,9-HpCDF	**6.0**			**0.01**	**0.060**
Total HpCDF	**250**				
OCDF	**170**			**0.0003**	**0.051**
Total TEQ Concentration					**20.781**

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	79	40 - 135
13C-1,2,3,7,8-PeCDD	74	40 - 135
13C-1,2,3,6,7,8-HxCDD	75	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	77	40 - 135
13C-OCDD	66	40 - 135
13C-2,3,7,8-TCDF	77	40 - 135
13C-1,2,3,7,8-PeCDF	70	40 - 135
13C-1,2,3,4,7,8-HxCDF	71	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	69	40 - 135

Soil Water Air Protection Enterprise

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: SED 1

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Geneva, Switzerland, June 2005.

CON	Confirmation analysis.
E	Estimated result. Result concentration exceeds the calibration range.
J	Estimated result. Result is less than the reporting limit.

Soil Water Air Protection Enterprise

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: SED 2

Lot-Sample #...:	G8A110301 - 002	**Work Order #...:**	KFFMX1AC	**Matrix....:**	SOLID
Date Sampled...:	01/10/08	**Date Received..:**	01/11/08	**Instrument:**	9D5
Prep Date......:	01/15/08	**Analysis Date..:**	01/21/08	**Units.....:**	pg/g
Prep Batch #...:	8015247	**Dilution Factor:**	1	**% Moisture:**	51

PARAMETER	RESULT		DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	**37**			**1**	**37.000**
Total TCDD	**410**				
1,2,3,7,8-PeCDD	**320**			**1**	**320.000**
Total PeCDD	**1400**				
1,2,3,4,7,8-HxCDD	**510**			**0.1**	**51.000**
1,2,3,6,7,8-HxCDD	**1300**			**0.1**	**130.000**
1,2,3,7,8,9-HxCDD	**960**			**0.1**	**96.000**
Total HxCDD	**7800**				
1,2,3,4,6,7,8-HpCDD	**22000**	**E**		**0.01**	**220.000**
Total HpCDD	**50000**				
OCDD	**81000**	**E**		**0.0003**	**24.000**
2,3,7,8-TCDF	**36**	**CON**		**0.1**	**3.600**
Total TCDF	**610**				
1,2,3,7,8-PeCDF	**53**			**0.03**	**1.600**
2,3,4,7,8-PeCDF	**64**			**0.3**	**19.000**
Total PeCDF	**1700**				
1,2,3,4,7,8-HxCDF	**300**			**0.1**	**30.000**
1,2,3,6,7,8-HxCDF	**200**			**0.1**	**20.000**
2,3,4,6,7,8-HxCDF	**170**			**0.1**	**17.000**
1,2,3,7,8,9-HxCDF	**7.4**			**0.1**	**0.740**
Total HxCDF	**5900**				
1,2,3,4,6,7,8-HpCDF	**5300**	**E**		**0.01**	**53.000**
1,2,3,4,7,8,9-HpCDF	**280**			**0.01**	**2.800**
Total HpCDF	**16000**				
OCDF	**5700**	**E**		**0.0003**	**1.700**
Total TEQ Concentration					**1,027.440**

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	15 *	40 - 135
13C-1,2,3,7,8-PeCDD	11 *	40 - 135
13C-1,2,3,6,7,8-HxCDD	14 *	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	14 *	40 - 135
13C-OCDD	19 *	40 - 135
13C-2,3,7,8-TCDF	14 *	40 - 135
13C-1,2,3,7,8-PeCDF	12 *	40 - 135
13C-1,2,3,4,7,8-HxCDF	14 *	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	12 *	40 - 135

Soil Water Air Protection Enterprise

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: SED 2

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Geneva, Switzerland, June 2005.

*	Surrogate recovery is outside stated control limits.
CON	Confirmation analysis.
E	Estimated result. Result concentration exceeds the calibration range.

Soil Water Air Protection Enterprise

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: SED 3

Lot-Sample #...:	G8A110301 - 003	**Work Order #...:**	KFFM01AC	**Matrix....:**	SOLID
Date Sampled...:	01/10/08	**Date Received..:**	01/11/08	**Instrument:**	9D5
Prep Date......:	01/15/08	**Analysis Date..:**	01/21/08	**Units.....:**	pg/g
Prep Batch #...:	8015247	**Dilution Factor:**	1	**% Moisture:**	47

PARAMETER	RESULT		DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	**1.9**	**JA**		**1**	**1.900**
Total TCDD	**36**				
1,2,3,7,8-PeCDD	**14**			**1**	**14.000**
Total PeCDD	**59**				
1,2,3,4,7,8-HxCDD	**22**			**0.1**	**2.200**
1,2,3,6,7,8-HxCDD	**48**			**0.1**	**4.800**
1,2,3,7,8,9-HxCDD	**38**			**0.1**	**3.800**
Total HxCDD	**290**				
1,2,3,4,6,7,8-HpCDD	**630**			**0.01**	**6.300**
Total HpCDD	**1200**				
OCDD	**3700**			**0.0003**	**1.100**
2,3,7,8-TCDF	**2.5**	**CON**		**0.1**	**0.250**
Total TCDF	**38**				
1,2,3,7,8-PeCDF	**2.6**	**J JA**		**0.03**	**0.078**
2,3,4,7,8-PeCDF	**3.3**	**J**		**0.3**	**0.990**
Total PeCDF	**95**				
1,2,3,4,7,8-HxCDF	**12**			**0.1**	**1.200**
1,2,3,6,7,8-HxCDF	**8.4**			**0.1**	**0.840**
2,3,4,6,7,8-HxCDF	**8.0**			**0.1**	**0.800**
1,2,3,7,8,9-HxCDF	ND		0.70	0.1	0
Total HxCDF	**230**				
1,2,3,4,6,7,8-HpCDF	**170**			**0.01**	**1.700**
1,2,3,4,7,8,9-HpCDF	**11**			**0.01**	**0.110**
Total HpCDF	**560**				
OCDF	**440**			**0.0003**	**0.130**
Total TEQ Concentration					**40.198**

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	61	40 - 135
13C-1,2,3,7,8-PeCDD	56	40 - 135
13C-1,2,3,6,7,8-HxCDD	59	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	67	40 - 135
13C-OCDD	60	40 - 135
13C-2,3,7,8-TCDF	58	40 - 135
13C-1,2,3,7,8-PeCDF	56	40 - 135
13C-1,2,3,4,7,8-HxCDF	61	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	62	40 - 135

Soil Water Air Protection Enterprise

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: SED 3

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Geneva, Switzerland, June 2005.

CON	Confirmation analysis.
J	Estimated result. Result is less than the reporting limit.
JA	The analyte was positively identified, but the quantitation is an estimate.

Soil Water Air Protection Enterprise

Dioxins/Furans, HRGC/HRMS (8290)

Client Sample ID: SED 4

Lot-Sample #...:	G8A110301 - 004	**Work Order #...:**	KFFM12AC	**Matrix....:**	SOLID
Date Sampled...:	01/10/08	**Date Received..:**	01/11/08	**Instrument:**	1D5
Prep Date......:	01/23/08	**Analysis Date..:**	01/25/08	**Units.....:**	pg/g
Prep Batch #...:	8024474	**Dilution Factor:**	1	**% Moisture:**	26

PARAMETER	RESULT		DETECTION LIMIT	TEF FACTOR	TEQ CONCENTRATION
2,3,7,8-TCDD	**2.0**			**1**	**2.000**
Total TCDD	**21**				
1,2,3,7,8-PeCDD	**8.4**			**1**	**8.400**
Total PeCDD	**44**				
1,2,3,4,7,8-HxCDD	**9.3**			**0.1**	**0.930**
1,2,3,6,7,8-HxCDD	**33**			**0.1**	**3.300**
1,2,3,7,8,9-HxCDD	**22**			**0.1**	**2.200**
Total HxCDD	**170**				
1,2,3,4,6,7,8-HpCDD	**560**			**0.01**	**5.600**
Total HpCDD	**990**				
OCDD	**4000**	**E B**		**0.0003**	**1.200**
2,3,7,8-TCDF	**1.8**	**CON**		**0.1**	**0.180**
Total TCDF	**30**				
1,2,3,7,8-PeCDF	**2.5**	**J**		**0.03**	**0.075**
2,3,4,7,8-PeCDF	**3.4**			**0.3**	**1.000**
Total PeCDF	**76**				
1,2,3,4,7,8-HxCDF	**7.8**			**0.1**	**0.780**
1,2,3,6,7,8-HxCDF	**6.8**			**0.1**	**0.680**
2,3,4,6,7,8-HxCDF	**5.5**			**0.1**	**0.550**
1,2,3,7,8,9-HxCDF	ND		0.96	0.1	0
Total HxCDF	**220**				
1,2,3,4,6,7,8-HpCDF	**120**			**0.01**	**1.200**
1,2,3,4,7,8,9-HpCDF	**6.2**			**0.01**	**0.062**
Total HpCDF	**410**				
OCDF	**330**			**0.0003**	**0.099**
Total TEQ Concentration					**28.256**

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	75	40 - 135
13C-1,2,3,7,8-PeCDD	56	40 - 135
13C-1,2,3,6,7,8-HxCDD	83	40 - 135
13C-1,2,3,4,6,7,8-HpCDD	75	40 - 135
13C-OCDD	82	40 - 135
13C-2,3,7,8-TCDF	72	40 - 135
13C-1,2,3,7,8-PeCDF	55	40 - 135
13C-1,2,3,4,7,8-HxCDF	70	40 - 135
13C-1,2,3,4,6,7,8-HpCDF	71	40 - 135

Soil Water Air Protection Enterprise

Dioxins/Furans, HRGC/HRMS (8290)

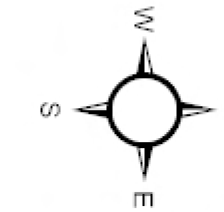
Client Sample ID: SED 4

Notes:

WHO TEFs for human risk assessment based on the conclusions of the World Health Organization meeting in Geneva, Switzerland, June 2005.

B	Method blank contamination. The associated method blank contains the target analyte at a reportable level.
CON	Confirmation analysis.
E	Estimated result. Result concentration exceeds the calibration range.
J	Estimated result. Result is less than the reporting limit.

Exhibit E: Sampling Locations Map for July 30, 2007 Sampling



Legend

- Sediment Samples - 7/12/2000
- Sediment Samples - 7/30/2007
- Drainage Ditch

0 180 360 720 Feet

Sediment Sample Collection Locations Union Pacific Balloon Track Eureka, California

Figure 8

CEA No. 07040

Exhibit F: Sampling Location Map for January 10, 2008 Sampling

Legend

- Locations of Sediment Samples Collected on 1/10/08
- Locations of Surface Water Samples Collected on 1/10/08
- Property Line / Site Boundary

0 200 400 800 Feet

Notes:
1. All locations are approximate.
2. Aerial photographic base obtained from Google 2008.

SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

Project: Former Southern Pacific Transportation Company Railroad Yard - 736 Broadway, Eureka, California		
Title: Locations of Sediment and Surface Water Samples Collected on 1/10/2008		
Drawn By: RK	Date: 1/18/2008	Figure No.: 1